



MADE IN USA

GCTS TESTING SYSTEMS

Accuracy Is The Underlying Strategy

Advanced Rock Testing Systems

GCTS is committed to designing accurate testing systems by integrating innovative software engineering with advanced hardware.



RTR-1000
Rapid Rock Triaxial Testing System
www.gcts.com

**ISO
9001:2015
Certified**



Company Vision

GCTS is internationally renowned for its high quality testing systems and client care. The design approach GCTS has utilized emphasizes the importance of the customer's needs. It is this approach that has dictated the level of success we have achieved to this date.

GCTS does not just offer testing equipment; we provide complete solutions for advanced material characterization. All of our systems are proudly designed and manufactured in the United States of America.

Our systems are designed to maximize client productivity by acquiring and processing testing data, then presenting the results in a simple and coherent format.

GCTS: Global Presence



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Rapid Rock Triaxial Testing Systems

RTR Series

- Static and dynamic closed-loop digital servo control
- Capable of performing stress or strain controlled and post-failure behavior tests
- Axial load capacities up to 4,500 kN
- Cell pressure capacities up to 210 MPa
- Frame stiffness up to 10 MN/mm
- Automated cell assembly—no fasteners needed
- Meets all ISRM and ASTM specifications for triaxial testing of rock samples
- Custom design to meet all needs
- Optional upgrades include: direct shear, true triaxial, ultrasonic, hydraulic fracturing, temperature control, and more



Specifications

Load Capacity	Up to 4,500 kN
Frame Stiffness	Up to 10 MN/mm
Confining Pressure Capacity	Up to 210 MPa
Pore Pressure Capacity	Up to 210 MPa
Max. Specimen Diameter	Up to 100 mm

Accessories

1. Upgrades for performance of other tests and advanced triaxial tests. Upgrades include: ultrasonic velocity, polyaxial, direct shear, differential strain analysis, temperature control, indirect tension, direct tension, fracture toughness, acoustic emissions, hydraulic fracturing, electrical resistivity, standard permeability, pulse-decay permeability, and corrosive fluid testing
2. Upgrade for temperature control up to 200°C
3. Silent flow hydraulic power supply

For more accessories please contact GCTS.

Description

The GCTS Rapid Triaxial Rock Testing Systems (RTR Series) are advanced systems capable of performing a wide variety of tests on rock specimens. These systems feature closed-loop digital servo control and are managed using advanced software and electronics, allowing for complete test automation for any test performed.

The RTR series can be completely customized to meet operator needs. As shown in the diagram on the next page, the operator simply chooses an axial load capacity, frame stiffness, confining pressure capacity, pore pressure capacity, and maximum specimen diameter as required for their testing and the system will be built to those specifications.

One of the best aspects of these systems is the triaxial cell. This cell is mounted to a hydraulic lift, allowing it to be raised for specimen loading and lowered for testing with a press of a button. Fasteners are not needed to hold this cell to the base. This increases the speed at which test preparation can be performed, creating additional time for testing.

This system is also compatible with the gTest iPhone/iPad application. This allows the operator to monitor the entire testing system and test results wirelessly over the Internet. As a result, the operator is free to perform other tasks in the laboratory. Additionally, the live testing results are able to be shared across the globe.

A - Axial Load:

RTR systems can be fitted with a loading actuator rated from 1,000 kN to 4,500 kN axial load

B - Frame Stiffness:

RTR load frames are available in three stiffness levels:
 Standard: 2,000 kN/mm
 Medium: 5,000 kN/mm
 High: 10,000 kN/mm

D - Pore Pressure:

70, 140 or 210 MPa

E - Specimen Size:

Maximum specimen diameter with internal instrumentation:
 Model A: 65 mm
 Model L: 100 mm

C - Confining Pressure:

70, 140 or 210 MPa



RTR	A	B	C	D	E
	A - Axial Load (kN)	B - Frame Stiffness (kN/mm)	C - Confining Pressure (MPa)	D - Pore Pressure (MPa)	D - Maximum Specimen Diameter (mm)
	1,000	S	2,000	Automatic Control	A
	1,500	M	5,000	70A	L
	2,000	H	10,000	140A	
	2,500		210A	210A	
	3,000		Manual Control	Manual Control	
	4,000		70M	70M	
	4,500		140M	140M	
			210M	210M	

Rock Triaxial Testing Systems

RTX Series

- Axial load capacities of up to 4,500 kN
- Confining pressure capacities of up to 210 MPa
- Frame stiffness up to 10 MN/mm
- Direct closed-loop digital servo control of axial stress, axial strain, radial strain, and several other calculated triaxial variables
- High pressure triaxial cell includes internal instrumentation to measure local axial and radial strains
- Ideal for easy performance of unconfined compression, triaxial, bending, indirect tension, fracture, creep, post-failure behavior, and other compression tests
- Optional ultrasonic measurement sensors available
- Optional high temperature control



Specifications

Load Capacity	Up to 4,500 kN
Frame Stiffness	Up to 10 MN/mm
Confining Pressure Capacity	Up to 210 MPa
Pore Pressure Capacity	Up to 210 MPa
Max. Specimen Diameter	Up to 100 mm

Accessories

1. Upgrades for performance of indirect tension, direct tension, fracture toughness, hydraulic fracturing, acoustic emissions, and ultrasonic tests
2. Upgrade for temperature control up to 200°C
3. Silent flow hydraulic power supply

For more accessories please contact GCTS.

Description

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The RTR series can be completely customized to meet operator needs. As shown in the diagram on the next page, the operator simply chooses an axial load capacity, frame stiffness, confining pressure capacity, pore pressure capacity, and maximum specimen diameter as required for their testing and the system will be built to those specifications.

One of the best aspects of these systems is the triaxial cell. This cell is mounted to a hydraulic lift, allowing it to be raised for specimen loading and lowered for testing with a press of a button. Fasteners are not needed to hold this cell to the base. This increases the speed at which test preparation can be performed, creating additional time for testing.

This system is also compatible with the gTest iPhone/iPad application. This allows the operator to monitor the entire testing system and test results wirelessly over the Internet. As a result, the operator is free to perform other tasks in the laboratory. Additionally, the live testing results are able to be shared across the globe.

Hydraulic Fracture Tester

HFT-70

- Performs hydraulic fracture, thermal fracture, wellbore stability, and rock permeability tests
- 70 MPa cell and fracture pressure capacity
- Hydraulic balance for hydrostatic stress state, can be used to apply deviator stresses for anisotropic stress state with up to 140 MPa vertical stress
- 32 electrical feed-through lines
- 7 fluid ports (5 specimen, 2 cell)
- Lift mechanism to facilitate specimen setup
- Thermally insulated port for thermal fractures tests



Specifications

Confining Pressure Capacity	70 MPa
Hydro-Fracture Pressure Capacity	140 MPa
Max. Specimen Diameter	70 mm
Max. Specimen Height	200 mm
Max. Temperature	200 °C

Description

The GCTS Hydraulic Fracture Tester (HFT-70) allows for the performance of fracture tests with a HPVC pressure intensifier. This fixture is typically used for hydraulic fracture, wellbore stability, and permeability tests. Tests can be performed with or without confining pressure.

The HFT triaxial cell comes with a hydraulic balance for application of hydrostatic stress state, but it can also be used for applying deviator stresses for anisotropic stress state with up to 140 MPa vertical stress on NX diameter specimens. A loading frame can be used to induce larger axial loads. The cell has four pore fluid ports plus a hydraulic fracturing fluid port, in addition to two confining fluid ports.

Typically, fracturing pressure is ramped up at a constant rate while radial strain is measured during the fracturing test to determine the fracturing stress. The system can also be upgraded with a temperature control option for testing from -30 °C to 200 °C.

Uniaxial Testing Systems

UCT Series

- Compression and tension loading system with electro-hydraulic closed-loop digital servo control
- Static and dynamic loading capabilities
- Adjustable crosshead design
- Accepts GCTS high pressure triaxial cell and other testing components
- Ideal for performing unconfined compression, bending, indirect tension, fracture, creep, and other material tests
- Available systems with load capacities up to 4,500 kN (1,000 kip) and stiffness up to 10 MN/mm
- Economical turn-key systems built to customer specifications



Specifications

Compression Load Capacity	up to 4,500 kN
Dynamic Load Capacity	up to 1,000 kN
Frame Stiffness	up to 10 MN/mm
Stroke	100 mm
Distance Between Columns	400 mm
Distance Between Platens	600 mm

Accessories

1. Platens for uniaxial rock and concrete testing
2. Brazilian indirect tension test
3. On-specimen axial and radial measurements
4. Flexural bending fixture
5. Rock triaxial cell

For more accessories please contact GCTS.

Description

The GCTS Uniaxial Testing Systems (UCT Series) are easy to use systems for determining the unconfined compressive strength of cylindrical specimens. The axial actuator is computer controlled and can easily be set to a specific load, deformation rate, or strain rate. These systems are capable of performing both static and dynamic tests.

Data collection is performed automatically with our advanced Windows™-based software. All test measurements can easily be viewed and exported for rapid analysis of results.

Rock Creep Testing System

eRCT-100

- 980 kN (100 ton) axial load capacity
- Load or displacement servo control
- Energy efficient testing (55 watts typical)
- Manual, computer and remote operation through mounted keypad, Windows application or mobile device software
- Accepts GCTS HTRX Triaxial Cells for confined testing
- Unconfined, Triaxial, and Creep testing software included for automatic data acquisition and report generation
- Performs tests according to ASTM D7070 and ASTM D7012
- Economically priced



Specifications

Compression Load Capacity	980 kN
Stiffness	700 kN/mm
Stroke	100 mm
Distance Between Columns	400 mm
Distance Between Platens	600 mm

Accessories

1. Ultrasonic velocity measurement apparatus
2. High pressure triaxial cell
3. Confining and pore pressure control upgrades
4. Hydraulic fracturing platens

For more accessories please contact GCTS.

Description

The GCTS Rock Creep Testing System (eRCT-100) is designed to reliably perform long-term tests. Its low power consumption makes it both cost effective and capable of continuing operation during short power outages using a battery UPS. An electromechanical load/displacement controller is used to servo control the axial actuator. The eRCT-100 can be upgraded with a pressure vessel and an energy-efficient ePVC electromechanical pressure/volume controller for long-term creep testing in triaxial conditions. A heating jacket is offered as an option to perform tests at elevated temperatures. An additional ePVC can also be added for pore pressure control.

The system includes 8 input channels with 24-bit resolution to record axial load and displacement as well as additional sensors such as local axial and radial strain sensors, temperature, etc. Also included is a keypad to manually adjust the piston position or seating load or to apply full load or deformation. Alternatively, this frame can be controlled wirelessly through a mobile device (iOS or Android) or Windows computer, either manually or through an application program.

GCTS offers several application programs to perform standard tests, such as Creep (Unconfined or Triaxial), UCS, Triaxial Compressive Strength, Indirect Tension, 3- or 4-Point Bending, etc. (Test fixtures sold separately).

Rock Polyaxial Testing System

RPS-100

- Independent control of stresses or strains on each of the three principal planes with a stress capacity of 140 MPa (20,000 psi)
- Deformation sensors on each face
- Pore pressure intensifier to saturate specimen and perform permeability tests
- Pore pressure ports on each face with control valves to select flow direction during permeability tests
- Available ultrasonic platens to measure P- and S-wave velocities on every principal plane
- Available heating jacket for temperature control up to 150°C
- Available hydraulic fracturing platens to perform wellbore stability tests



Specifications

Stress Capacity	140 MPa
Cell Pressure Capacity	140 MPa
Max. Specimen Side	100 mm

GCTS offers many upgrades for this system, making it possible to perform a wide variety of tests. A temperature control unit can provide complete computer control of the temperature of the system, enabling tests to be performed at up to 150°C. Hydraulic fracturing fixtures are available to carry out wellbore stability tests. Semicircular platens are available to test cylindrical specimens. Also available are ultrasonic platens, which allow for P- and S-wave velocities to be measured on each of the three planes.

Accessories

1. Ultrasonic (compressional and bender element) sensors and electronics
2. Temperature control upgrade
3. Hydraulic fracturing platens
4. Semicircle platens for cylindrical specimens

For more accessories please contact GCTS.

Description

The GCTS Rock Polyaxial System (RPS-100) can be used to perform true triaxial tests on square rock specimens. This system allows for complete computer control of either the stress or the strain on each face of the specimen. Therefore, any stress state can be tested using this device.



Piston Control Cabinets for RPS-100

Large-Scale Rock Polyaxial Testing System

RPS-600

- Independent control of stresses or strains on each of the three principal planes with a stress capacity of 100 MPa (15,000 psi)
- Accepts cubical specimens with sides up to 300 mm
- Pore pressure control up to 140 MPa
- Deformation sensors on each face
- Available ultrasonic platens to measure P- and S-wave velocities on every principal plane
- Available temperature control system with control up to 200oC
- Available hydraulic fracturing platens to perform wellbore stability tests
- Available acoustic emissions measurement



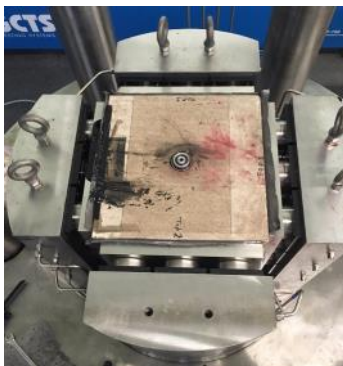
Specifications

Stress Capacity	100 MPa
Cell Pressure Capacity	140 MPa
Max. Specimen Side	300 mm

Accessories

1. Ultrasonic (compressional and bender element) sensors and electronics
2. Temperature control upgrade
3. Hydraulic fracturing platens
4. Acoustic emissions measurements

For more accessories please contact GCTS.



Specimen Installed in RPS-600

Description

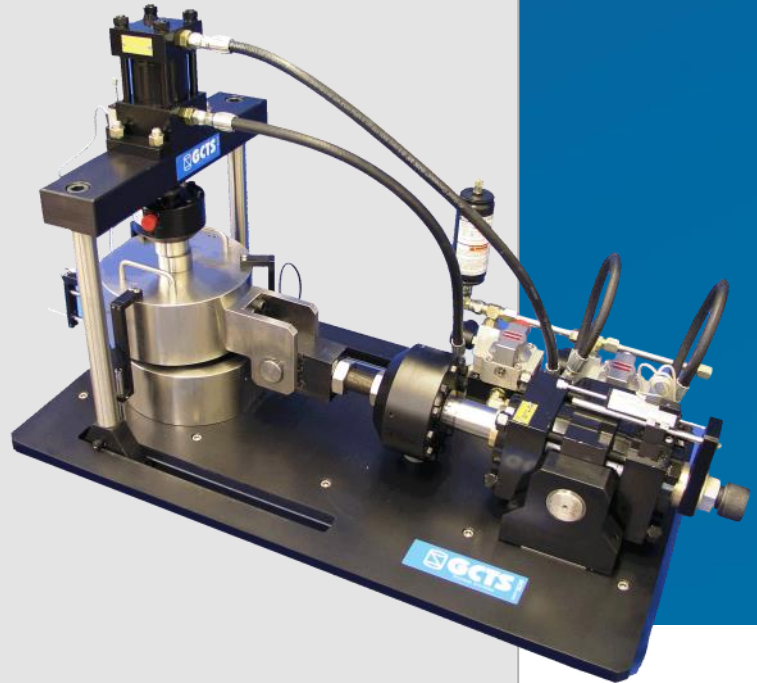
The GCTS Large-Scale Rock Polyaxial Testing System (RPS-600) is designed to perform true triaxial tests on cubical rock specimen with sides measuring up to 300 mm (12 in.). All three principal stresses can be computer controlled, allowing all stress states to be tested. The maximum major principal stress has a capacity of 100 MPa (15,000 psi). Stresses are applied using three rectangular platens on each side of the specimen, allowing the stresses to be applied uniformly to the specimen.

Various upgrades can be applied to the RPS-600 to enable it to perform many different tests. Acoustic emission and ultrasonic platens are optional accessories for this system. A temperature control system can be added to allow for testing in temperatures up to 200°C. Hydraulic fracturing platens are an additional accessory used for wellbore stability tests. Various other platen sizes are available to perform tests on rectangular specimens larger or smaller than the standard 300 mm cube.

Servo-Controlled Rock Direct Shear System

RDS-200

- Closed-loop servo control of double acting (push/pull) 100 kN shear load actuator with 25 mm stroke and 50 kN normal load capacity with 25 mm stroke
- Normal load stiff reaction frame mounted on sliding bearings to minimize horizontal friction while keeping the normal load vertical throughout the full shear displacement
- 150 mm (6 inch) inside diameter sample rings for specimens up to 150 mm high
- Software for automatic performance of direct shear tests with constant normal stress or normal stiffness
- Real time graphical display of test progress
- Optional economical manually-controlled actuators with automatic data acquisition are available



Specifications

Load Capacity	100 kN shear, 50 kN normal
Stroke	25 mm shear & normal
Max. Specimen Diameter	150 mm
Max. Specimen Height	150 mm

Accessories

1. 100 mm diameter specimen rings
2. 150 mm diameter specimen rings
3. Specimen ring holder for 100 mm diameter
4. Specimen ring holder for 150 mm diameter
5. Grouting compound for specimen preparation

For more accessories please contact GCTS.

Description

The GCTS Servo-Controlled Rock Direct Shear System (RDS-200) is a computer controlled, easy to use device for testing a wide range of rock specimen configurations. Cylindrical cores, cubes, prisms, and rock fragments of irregular shape can be used to determine the shear strength.

This system features electro-hydraulic closed-loop digital servo control of the shear and normal loads for test automation. The included software program accepts inputs from the normal load sensor and up to four normal deformation sensors (software automatically calculates the average normal deformation). Loads or deformations for both the shear and normal actuators can be prescribed for automatically performing advanced tests such as the constant or calculated normal stiffness direct shear test.

Specimens are cured within removable specimen rings and then dropped inside the shear box, allowing the preparation of multiple specimens using additional rings, increasing test production.

Servo-Controlled Rock Direct Shear System

RDS-200XL

- Closed-loop servo control of double acting (push/pull) 150 kN shear load actuator with 50 mm stroke and 150 kN normal load capacity with 50 mm stroke
- Normal load stiff reaction frame mounted on sliding bearings to minimize horizontal friction while keeping the normal load vertical throughout the full shear displacement
- 150 mm (6 inch) inside diameter sample rings for specimens up to 150 mm high
- Software for automatic performance of direct shear tests with constant normal stress or normal stiffness
- Real time graphical display of test progress
- Other load capacities and specimen sizes are available, including large-scale test systems for shear loads of up to 1,000 kN and specimen sizes up to 300 mm diameter



Specifications

Load Capacity	150 kN shear, 150 kN normal
Stroke	50 mm shear, normal
Max. Specimen Diameter	150 mm
Max. Specimen Height	150 mm

Accessories

1. 100 mm diameter specimen rings
2. 150 mm diameter specimen rings
3. Specimen ring holder for 100 mm diameter
4. Specimen ring holder for 150 mm diameter
5. Grouting compound for specimen preparation

For more accessories please contact GCTS.

Description

The GCTS Rock Direct Shear XL System (RDS-200XL) is a direct shear testing system capable of large axial and shear loads. A large range of rock specimens can be tested, as cylindrical cores, cubes, prisms, and fragments can be used.

This system features electro-hydraulic closed-loop digital servo control of the shear and normal actuators. The included software allows up to four normal deformation sensors to be used in order to calculate an average normal deflection. Both Constant Normal Stiffness and Constant Normal Stress tests can be performed using this system.

Specimens are prepared in removable specimen rings before being placed in the shear box, allowing the preparation of multiple specimens using additional rings, increasing test production.

Servo-Controlled Rock Direct Shear System

RDS-300

- Closed-loop servo control of double acting (push/pull) 300 kN shear load actuator with ± 50 mm stroke and 300 kN normal load capacity with 100 mm stroke
- Includes adjustable locking mechanism to prevent rotation of the top box in any one direction, two directions, or none (fixed so that no shear plane rotations are allowed)
- Accepts 150 mm (6 inch) diameter samples as well as 100 mm x 100 mm cubical specimens up to 150 mm high
- Software for automatic performance of direct shear tests with constant normal stress or normal stiffness
- Other load capacities and specimen sizes are available, including large-scale test systems for shear loads of up to 1,000 kN and specimen sizes up to 300 mm diameter or side



Specifications

Load Capacity	300 kN shear, 300 kN normal
Stroke	± 50 mm shear, 100 mm normal
Max. Specimen Diameter	150 mm
Max. Specimen Height	150 mm

Accessories

1. 100 mm diameter specimen rings
2. 150 mm diameter specimen rings
3. Specimen ring holder for 100 mm diameter
4. Specimen ring holder for 150 mm diameter
5. Grouting compound for specimen preparation

For more accessories please contact GCTS.

Description

The GCTS Rock Direct Shear System (RDS-300) is a versatile device for testing a wide range of rock specimen configurations. Cylindrical cores, cubes, prisms, and rock fragments of irregular shape can be used to determine the shear strength. This system features electro-hydraulic closed-loop digital servo control of the shear and normal loads for test automation. The included software program accepts inputs from the normal load sensor and up to four normal deformation sensors (software automatically calculates the average normal deformation). Loads or deformations for both the shear and normal actuators can be prescribed for automatically performing advanced tests such as the constant or calculated normal stiffness direct shear test.

The GCTS software automatically calculates the corrected specimen area, the normal and shear stresses, shear deformation, and the average normal deformation. Loads, stresses or deformations for both the shear and normal actuators can be directly prescribed to perform advanced tests. The hydraulic servo control of the normal load has a very low compliance that enables the precise performance of tests such as the normal stiffness control test, where the normal deformation is a function of a prescribed stiffness to simulate actual compressibility of a ground shear plane.

Rock Direct Shear & Triaxial System

RDS-500

- Closed-loop servo control of double acting (push/pull) 300 kN shear load actuator with ± 50 mm stroke
- 1,500 kN normal load capacity with 100 mm stroke
- Includes adjustable locking mechanism to prevent rotation of the top box in any one direction, two directions, or none (fixed so that no shear plane rotations are allowed)
- Accepts 150 mm (6 inch) diameter samples as well as 100 mm x 100 mm prismatic specimens up to 150 mm high
- Software for automatic performance of direct shear tests with constant normal stress or normal stiffness
- Capable of performing unconfined uniaxial or triaxial tests with optional hardware



Specifications

Load Capacity	300 kN shear, 1,500 kN normal
Stroke	± 50 mm shear, 100 mm normal
Max. Specimen Diameter	150 mm
Max. Specimen Height	150 mm

Accessories

1. 100 mm diameter specimen rings
2. 150 mm diameter specimen rings
3. Specimen ring holder for 100 mm diameter
4. Specimen ring holder for 150 mm diameter
5. Grouting compound for specimen preparation

For more accessories please contact GCTS.

Description

The GCTS Rock Direct Shear and Triaxial System (RDS-500) is a versatile device for testing a wide range of rock specimen configurations. Cylindrical cores, cubes, prisms, and rock fragments of irregular shape can be used to determine the shear strength.

This system features electro-hydraulic closed-loop digital servo control of the shear and normal loads for test automation. The included software program accepts inputs from the normal load sensor and up to four normal deformation sensors (software automatically calculates the average normal deformation). Loads or deformations for both the shear and normal actuators can be prescribed for automatically performing advanced tests such as the constant or calculated normal stiffness direct shear test.

This system can be upgraded with a triaxial cell, pressure intensifiers, unconfined loading platens, indirect tension (Brazilian) platens, and other fixtures to perform most of the laboratory mechanical tests required for rocks.

Wireless Point Load Tester

PLT-2W

- 100 kN load capacity
- Compact, light design (<16 kg)
- Wireless data acquisition
- Includes load and displacement sensors
- Automatic specimen gauging
- Mobile applications for automatic data acquisition and analysis
- User-selectable units
- Internal battery operation
- Optional ultrasonic velocity platens available
- Optional unconfined compression test platens available
- Optional Brazilian Indirect Tension test fixture available



Specifications

Load Capacity	100 kN
Stroke	50 mm
Vertical Opening	125 mm
Horizontal Opening	100 mm

Accessories

1. Watertight, airtight, crushproof carrying case
2. Ultrasonic Velocity Platens
3. Unconfined Compression Test Platens
4. Brazilian Indirect Tension Test Fixture
5. Brinell Hardness Platens

For more accessories please contact GCTS.

Description

The design of the GCTS Point Load Testing System (PLT-2W) emphasizes precision and productivity. The standard system includes load and deformation sensors as well as automatic data acquisition and analysis through the use of a mobile application. This application software can automatically measure the size of the specimen and calculate the average unconfined compressive strength during testing. All measurements are performed automatically, minimizing user errors and increasing the speed of testing.

The data acquisition electronics are safely located inside a metal housing and use Bluetooth wireless technology to send test data in real-time to the connected mobile device. The application automatically provides a correction to the test data to give the frame "virtual infinite stiffness." After performing the test, the complete data report and test analysis can be sent via email directly from the application.

Many different options are available for the PLT-2W. Unconfined compression tests can be performed using the optional platens and application. A fixture and application are available for performing Brazilian Indirect Tension tests. Ultrasonic platens are also available for measurement of the P-wave velocity.

Rock Abrasiveness Apparatus

RAA-100

- Measurement apparatus for determination of rock abrasiveness as specified by the CERCHAR test
- Meets ASTM D7625 specifications
- Precision slide for smooth movement with graduated knob for accurate scratch distance control with 0.01 mm precision
- Includes one hundred (100) sharp steel indenters with hardness of 200 kg/mm² and 90° cone angle according to the CERCHAR test
- Steel block crosshead with stainless steel linear ball bearings for easy application of required 70 N force
- Accepts specimens with maximum width of 76 mm (3 in) and 150 mm height (6 in)
- Rock holding vice with anodized aluminum jaws for firm no-slip grip during the test



Specifications

Specimen Diameter Up to 100 mm (4 inch)
 Apparatus Material Anodized aluminum, steel

Accessories

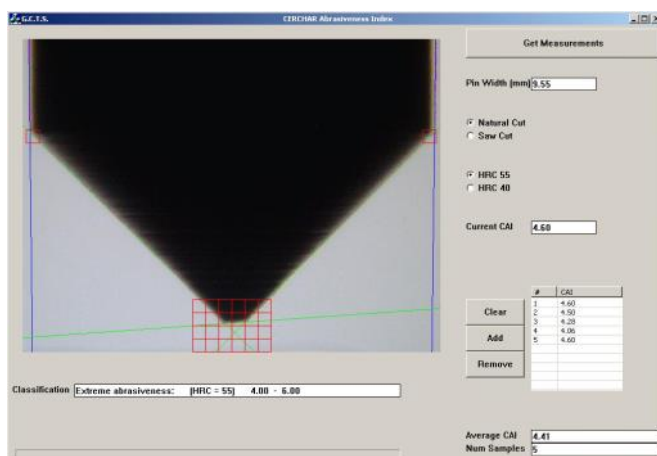
1. Microscope
2. Steel indenters
3. Sharpener for steel indenters

Description

The GCTS Rock Abrasiveness Apparatus (RAA-100) is used for the measurement of rock abrasiveness under the standards specified by the CERCHAR test. The test consists of measuring the wear flat on the standard steel indenter with 200 kg/mm² hardness loaded with 70 N force, after it has scratched 10 mm distance on the rock surface. The indenter is examined under the microscope and the amount of wear is correlated to the CERCHAR Abrasiveness Index (CAI).

The RAA-100 features a precision slide for smooth movement of the rock specimen over the required scratch distance. It also comes with a graduated knob for accurate scratch distance control with 0.01 mm precision. The slide movement is controlled with a precision threaded acme rod with 1 mm pitch (1 mm horizontal movement per knob revolution).

Included in the RAA-100 package are one hundred (100) sharp steel indenters with 200 kg/mm² hardness and 90° cone angle, rock holding vise and anodized aluminum and stainless steel construction loading frame.



Ultrasonic Velocity Measurement System

ULT-200

- 40 MHz sampling rate with 16-bit resolution
- Smart software features for accurate measurement of wave velocities
- Ultrasonic velocity measurements of compression and shear waves in asphalt, soil, rock, & concrete specimens
- Digitally controlled pulser and receiver including a switch to automatically select P- or S-wave transducers
- Hardware and software to accommodate P, S1, S2 inputs
- State-of-the-art software for data acquisition, analysis, storage, plotting, & reporting
- Available transducer platens for use inside soil and rock triaxial cells



Specifications

Sampling Rate	156 Hz—40 MHz
Resolution	16 bit
Inputs	P, S1, S2
Wave Pulse Output	Unipolar 45-100 V Bipolar 90-200V
Max. Input Voltage	± 500 mV
Input Impedance	5,000-10,000 Ω
Output Impedance	50 Ω
Max. Power per Pulse	10 mJ

Description

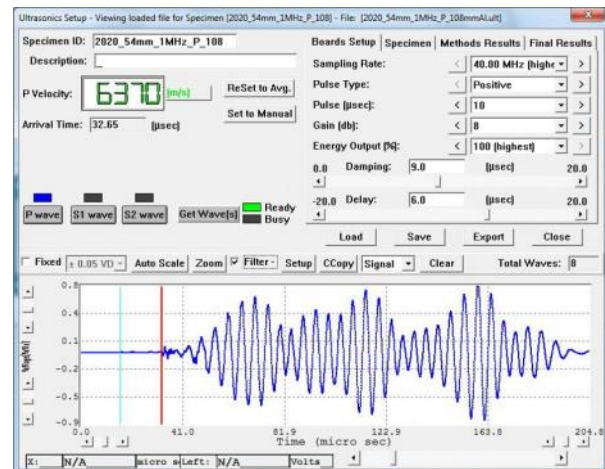
The ULT-200 Ultrasonic Velocity Test System is a turnkey system and includes everything required to perform Ultrasonic Velocity measurements on laboratory specimens. The new hardware and software utilize the latest technology to allow for precise determination of wave velocities.

With the ULT-200 the user also has the ability to control the pulse signal polarity and number of pulses to stack, this is important in helping to eliminate the influence of the compression wave signals on the relatively weaker Shear wave signals. The ULT-200 system uses a fast-acting pulser that provides excitation to the ultrasonic sensor and an ultra high speed Analog-to-digital converter for storing the resulting waveforms signals. The sampling rate

can be selected from 40 MHz to a sampling rate as low as 156 Hz allowing the user to capture a wide range of ultrasonic signals.

Within the CATS Ultrasonic software the user is able to digitally control the receiver and pulser, ensuring an easy setup and high degree of repeatability. This software also allows for automatic measurement while performing triaxial or unconfined shear loading. The ultrasonic data can be collected at any specified interval, such as time, stress, strain or any other test parameter.

Included with this system is a set of combination platens designed for both P and S wave velocity measurements. Available platens include models for benchtop testing, unconfined loading, soil triaxial loading, and rock (high pressure) triaxial loading.



Rock Strain Measurement Devices

DEF-5000 Series

- Measures axial and lateral strains directly on the test specimen
- Two axial sensors and one circumferential sensor
- Uses LVDTs for ease of operation
- Available for specimen diameters from 25 mm to 150 mm
- Models available for up to 210 MPa pressure and up to 200 °C temperature testing
- Very easy to setup and use
- Cantilever model DEF-CAN available for measuring anisotropic radial strains on samples with a diameter up to 100 mm



Specifications

Model #	Specimen Diameter (mm)	Displacement Range (mm)
DEF-5100	25 to 55	5
DEF-5200	50 to 76	5
DEF-5300	70 to 100	10
DEF-CAN	25 to 100	4

Description

The GCTS Rock Deformation Device (DEF-5000) measures axial and lateral strains directly on the specimen, providing accurate results. The device consists of an upper and lower support ring machined with a low weight, high strength design. The rings include spring loaded set screws to allow for specimen expansion during loading. A set of perforated rods with preset lengths are included to position the axial rings at predefined gauge lengths without difficulty.

The circumferential device is built with small, high precision rollers and stiff linkages for high accuracy strain measurements. Thumb screws are also provided to easily null the LVDT sensors. The DEF-CAN device utilizes a cantilever design with strain gauges to make anisotropic radial strain measurements on samples with a diameter from 25 to 100 mm.

The GCTS rock deformation device is available in standard and custom sizes with LVDT deformation ranges from 2 to 10 mm.

This device can be used within our high pressure triaxial cell as well as for elevated or cold temperature testing. Elastic constants such as Young's modulus and Poisson's ratio can be determined as well as inelastic strains that occur after sample failure (post-failure behavior). Direct servo control of axial or radial strains can be performed with this device.



DEF-CAN-NX

Hydraulic Pressure Intensifier Systems

HPVC-070/140/210

- Closed-loop digital servo control of pressure or flow (volume) with bumpless transfer
- 210 MPa (30,000 psi) pressure range
- Up to 500 cm³ stroke capacity
- Stainless steel construction
- Can be used as a volume change measurement device for triaxial and permeability testing



Specifications

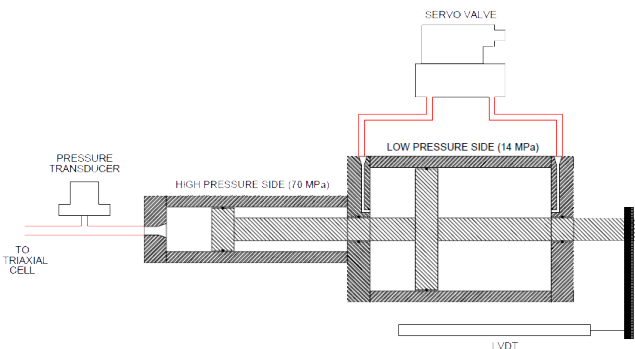
Control Precision	Better than ± 0.1 MPa (15 psi)
Pressure Transducer Resolution	0.02 MPa
Volume Transducer Resolution	0.01 cc
Analog Pressure Test Gauge Accuracy	$\pm 0.25\%$
Fluid Media Compatibility	Oil and Water
Fluid Reservoir Capacity	19 liter (5 gallon)
Required Pressure Input	21 MPa (3,000 psi)

Description

GCTS Pressure Intensifiers (HPVC) are ideal for the servo control of the cell pressure in triaxial tests, head pressure in permeability tests, or fluid pressure in hydro-fracture tests. This intensifier can also be used to measure flow in permeability tests and volume change in triaxial tests while applying prescribed pressures. Together with GCTS digital servo controller and the triaxial software, the performance of more advanced tests, such as stress/strain path, are able to be completed.

The HPVC system is mounted in a metal cabinet on casters to house the confining pressure/volume servo-controlled intensifier, fluid reservoir, sight level gauge, and Venturi vacuum pump. All valves are mounted on the front panel for easy intensifier operation and filling or draining the cell.

GCTS makes a dual piston intensifier model for tests where continuous flow is required and pressure spikes cannot be tolerated. These models include two intensifiers and two servo valves together with the necessary check valves, plumbing, and special control software for automatic operation. Also available, as an alternative, is an economical air/oil pressure booster. These units operate with 700 kPa (100 psi) air pressure input for a 70 MPa (10,000 psi) output. GCTS pressure boosters offer a low cost, trouble-free operation and are ideal for use in creep and sustained loading in long-term tests.



HPVC Pressure Intensifier Schematic

Electromechanical Pressure Controllers

ePVC Series

- Standalone Pressure / Volume Intensifier with Controller
- Controlled by on-board keypad, computer, or mobile device
- 1 to 210 MPa pressure range models
- As low as 0.05 kPa resolution
- Up to 823 cc volume stroke
- As low as 0.0002 cc resolution
- Up to 1,236 cc/min. flow rate @ 5% rated pressure
- Closed-loop digital servo control of pressure or flow (volume) with “bumpless” transfer
- TCP/IP Communications
- Optional models available for corrosive fluids
- Continuous flow models with no recharge pauses are available
- Power: 100–240 VAC, 50/60 Hz @ 1 KVA



Small, Medium, and Large Volume Models

Description

The ePVC Series of Standalone Pressure / Volume Controllers provide independent control of pressure or flow for a variety of applications. These controllers are electromechanical and only require 100-240 VAC, 50/60 Hz power for operation - no hydraulic power is needed!

The ePVCs feature closed-loop servo-control of the pressure or volume. They include large volume capacities and strokes with direct, integrated transducers for precise volume measurements. This prevents gear backlash and control errors caused by motor encoders found in other systems.

These controllers are ideal for the control of confining pressure in triaxial tests, head pressure in permeability tests, fluid flow or pressure in hydro-fracture tests, or even the axial load in long-term creep tests. They can also be used for any industrial process where precise programming of pressure or flow rate is required.

The ePVCs can also be used to measure flow in permeability tests or measure volume change in triaxial tests while applying the prescribed pressure.

Standard ePVC models have wetted parts made of stainless steel for use with oil or water. The Medium and Large series can alternatively be made of Hastelloy for use with brine or

other corrosive fluids. Aluminum models are also available for use exclusively with hydraulic oil.

GCTS also offers continuous-flow models for use when a pause to recharge the intensifier is unacceptable. Since there is no pause at the end of each intensifier’s stroke, true continuous flow is provided.

A front panel keypad is provided to easily set any desired pressure or flow rate manually. The ePVCs also include interface programs for PC and mobile devices (iOS, Android and Windows) to remotely set pressures or flow rates. Multiple units can be linked through our CATS software for simultaneous control as required by triaxial, hydro-fracturing, creep, and other testing applications.

The ePVCs also include six analog input channels with data acquisition that can be programmed to record external sensors.



Mobile Control Application

Quick High Pressure Triaxial Cell

QTRX-010

- 70 MPa (10,000 psi) pressure and 500 kN (100 kip) axial load capacity
- Quick “drop-in” specimen setup
- Axial and radial strain measurements
- Upper platen provided with a spherical seat to compensate for non-parallel specimen ends
- Hardened stainless steel construction
- Bottom pore pressure plumbing provided for effective stress measurements
- Includes triaxial software and automatic data acquisition with USB interface
- Accepts samples with a diameter of 25.4 mm or 38.1 mm and a length of 2 times the diameter (one different set of platens and membrane retainer is required for each size)



Specifications

Pressure Capacity	70 MPa
Specimen Diameter	25.4 mm or 38.1 mm
Material	Stainless steel

Accessories

1. Manual load frame for axial load application.
2. Panel for application of cell pressure.

For more accessories please contact GCTS.

Description

The GCTS Quick Triaxial Cell (QTRX-010) is designed for fast and easy testing of rock cores with a diameter of 25.4 mm or 38.1 mm. The triaxial cell has a built-in membrane where specimens are simply dropped inside from the top. Three lateral LVDTs are connected directly to the specimen to precisely measure the radial strain. The LVDTs eliminate the time-consuming task of gluing strain gauges onto the specimen to measure radial strains. Axial strains are measured with two averaging vertical LVDTs.

GCTS offers economical loading frames that are manually operated (hand pump) to apply axial loads up to 500 kN. The QTRX-010 triaxial cell fits inside the GCTS Point Load tester frame. GCTS also offers several different pumps (manual and automated) for applying the cell pressure. The complete system (triaxial cell, loading frame, and data acquisition) fits inside a carrying case.

The included automatic data acquisition with USB interface allows the connection to a laptop or PC computer for real time display of stress-strain curves. The QTRX-010 is ideal for the classroom.

High Pressure Triaxial Cells

HTRX-070/140/210

- Pressure capacity: 70, 140 and 210 MPa
- Stainless steel construction
- Accepts samples with a diameter from 25 mm to 100 mm with length of 2 times the diameter
- Upper platen provided with a spherical seat to compensate for non-parallel specimen ends
- Top and bottom pore pressure plumbing provided for effective stress and permeability measurements
- Electrical feedthrough connectors for GCTS axial and circumferential deformation measurement devices, ultrasonic sensors, and other special transducers
- Built to customer specifications
- Hydraulic balance option available for each cell



Specifications

Pressure Capacity	Up to 210 MPa
Specimen Diameter	Up to 100 mm
Material	Stainless steel
Temperature Rating	200 °C

Accessories

1. Ultrasonic velocity measurement platens.
2. Axial and circumferential deformation package.
3. High & low temperature control.
4. Hydraulic lift mechanism.

For more accessories please contact GCTS.

Description

The GCTS High Pressure Triaxial Cells (HTRX 070/140/210) are designed for testing rock specimens with diameters up to 100 mm (4 inch) and 200 mm (8 inch) lengths at confining pressures of up to 210 MPa and axial loads of up to 4,500 kN. Other specimen diameters can also be tested with the use of optional platens.

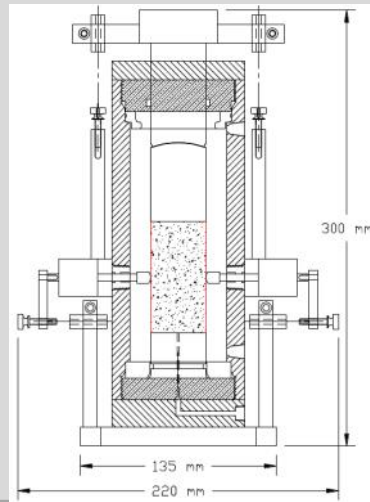
The 150 mm inside diameter of the cell wall and the electrical feedthrough connectors installed at the cell base allow the use of in-vessel instrumentation for precise measurements of the deformation modulus and of Poisson's ratio. The standard specimen platens have O-ring grooves for sealing the specimen jacket and an upper spherical seat to minimize stress concentrations due to non-parallel specimen ends. Pore fluid lines and ports for both upper and lower platens are also standard for effective stress and permeability measurements.

Cell and pore fluid connectors are provided at the cell base for easy interface with either the GCTS computer servo-controlled pressure intensifier or the GCTS air/oil pressure booster system. A loading piston with spherical seating is also provided with this triaxial cell.

The typical triaxial cell includes four electrical feedthrough connectors with four lines each (sixteen electrical lines total) to connect a variety of internal sensors such as deformation gauges, P- and S-wave velocity transducers and acoustic emission sensors. Additional feedthroughs can be supplied.

Rock Triaxial Cells

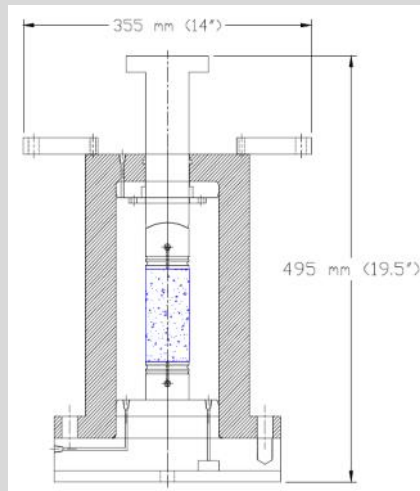
HTRX-010



Specifications

Pressure capacity:	70 MPa (10,000 psi)
Internal diameter (ID):	67 mm (2.5 in)
Overall width:	220 mm (8.7 in)
Overall height:	300 mm (11.8 in)
Mass:	18 kg (40 lbf)
Max. specimen size with internal instrumentation:	
Diameter:	54.7 mm (2.125 in)
Height:	108 mm (4.25 in)

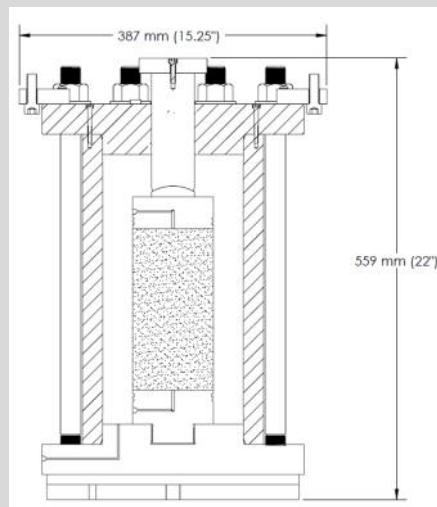
HTRX-070



Specifications

Pressure capacity:	70 MPa (10,000 psi)
Internal diameter (ID):	127 mm (5 in)
Overall width:	355 mm (14 in)
Overall height:	495 mm (19.5 in)
Mass:	111 kg (245 lbf)
Max. specimen size with internal instrumentation:	
Diameter:	54.7 mm (2.125 in)
Height:	108 mm (4.25 in)

HTRX-070L

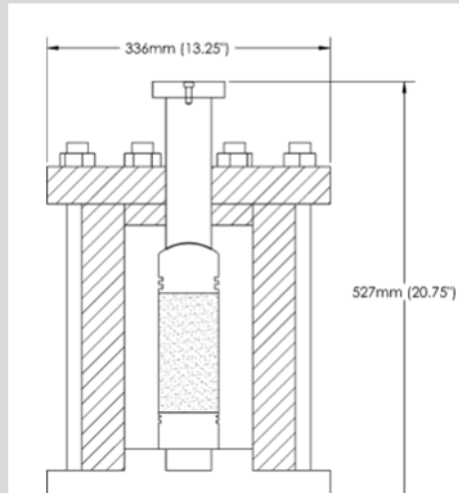


Specifications

Pressure capacity:	70 MPa (10,000 psi)
Internal diameter (ID):	178 mm (7 in)
Overall width:	387 mm (15.25 in)
Overall height:	559 mm (22 in)
Mass:	135 kg (298 lbf)
Max. specimen size with internal instrumentation:	
Diameter:	100 mm (4 in)
Height:	200 mm (8 in)

Rock Triaxial Cells

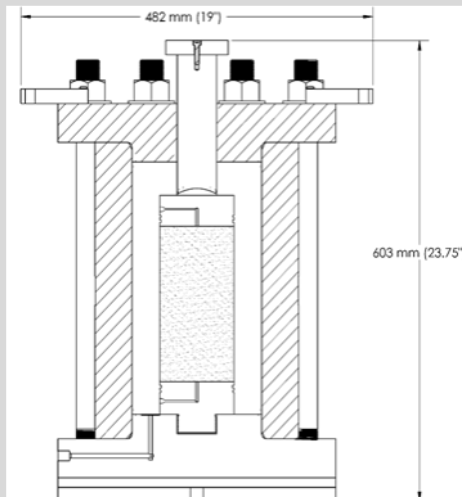
HTRX-140



Specifications

Pressure capacity:	140 MPa (20,000 psi)
Internal diameter (ID):	152 mm (6 in)
Overall width:	336 mm (13.25 in)
Overall height:	527 mm (20.75 in)
Mass:	119 kg (262 lbf)
Max. specimen size with internal instrumentation:	
Diameter:	76 mm (3 in)
Height:	152 mm (6 in)

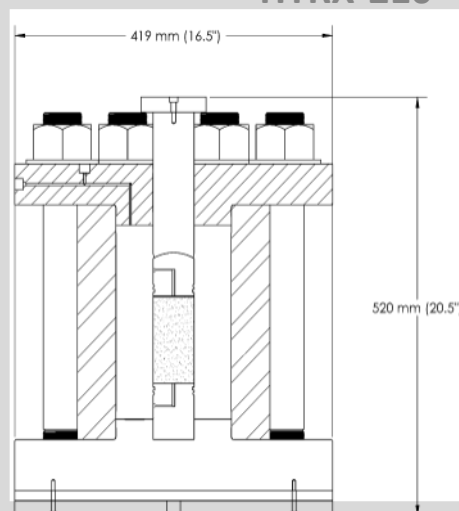
HTRX-140XL



Specifications

Pressure capacity:	140 MPa (20,000 psi)
Internal diameter (ID):	178 mm (7 in)
Overall width:	482 mm (19 in)
Overall height:	603 mm (23.75 in)
Mass:	248 kg (546 lbf)
Max. specimen size with internal instrumentation:	
Diameter:	100 mm (4 in)
Height:	200 mm (8 in)

HTRX-210



Specifications

Pressure capacity:	210 MPa (30,000 psi)
Internal diameter (ID):	152 mm (6 in)
Overall width:	419 mm (16.5 in)
Overall height:	520 mm (20.5 in)
Mass:	278 kg (612 lbf)
Max. specimen size with internal instrumentation:	
Diameter:	76 mm (3 in)
Height:	152 mm (6 in)

Rock Polyaxial (True Triaxial) Fixtures

RPX-150/300

- Perform polyaxial (true triaxial) tests within GCTS rock triaxial cells
- Independent control of σ_1 , σ_2 , σ_3 (where $\sigma_1 \neq \sigma_2 \neq \sigma_3$) or ϵ_1 , ϵ_2 , ϵ_3 or a combination of stress or strain control for each axis
- Stress control up to 70 MPa
- Measures strains in all three orthogonal directions
- RPX-150 accommodates cubical or cylindrical rock specimens with maximum dimensions of 38.1 mm x 38.1 mm x 76.2 mm or 38.1 mm diameter by 76.2 mm height
- RPX-300 accommodates cubical or cylindrical rock specimens with maximum dimensions of 50.8 mm x 50.8 mm x 101.6 mm or 50.8 mm diameter by 101.6 mm height
- Stainless steel construction
- Optional ultrasonic sensors to measure P- and S-wave velocities under different stress states
- Optional hydraulic fracturing platens available to perform wellbore stability tests
- Customized fixtures available to fit existing triaxial cells



Specifications

Stress Capacity	70 MPa (10,000 psi)
Material	Stainless steel
Max. Temperature	200°C

Accessories

1. Ultrasonic Velocity Platens
2. Hydraulic Fracturing Platens

Description

The GCTS Rock Polyaxial Fixtures (RPX-150/300) can be used to study the intermediate principal stress effect on rock engineering behavior and adequately describe the strength of rock under a general system of polyaxial compressive stresses. The RPX-150 and RPX-300 are simple and economical fixtures that enhance the capabilities of standard GCTS rock triaxial systems that include confining and pore pressure control. These fixtures are designed to fit inside GCTS triaxial cells and use the load frame to (typically) apply σ_1 , the confining pressure to apply σ_2 and the pore pressure system to apply σ_3 through the fixture's flat jacks.

GCTS also offers semicircular platens to test cylindrical specimens together with GCTS hydraulic fracturing fixtures to approximate the effects of anisotropic stress state on borehole stability. Although the stress state applied with these semicircular loading jacks is not uniform, it is much easier to prepare and test cylindrical specimens.

Ultrasonic sensors can be provided to study the effects of anisotropic stress conditions on compression and shear wave velocities. Velocities for all three axes can easily be measured during polyaxial tests with this option.

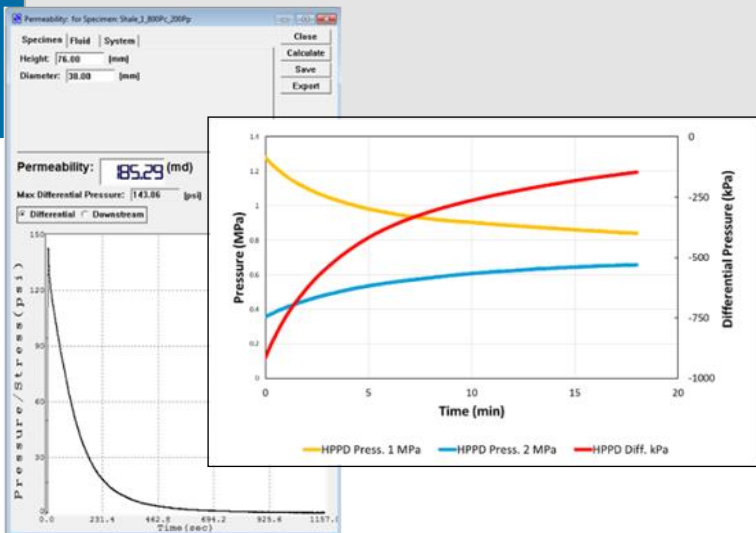


RPX-300 and Specimen

Fast Pulse Decay Permeability Apparatus

HPPD-20

- Apparatus for measurement of rock permeability using the Fast Pulse Decay method
- Two (2) 2,000 cc volume stainless steel reservoirs
- Two (2) 500 cc volume stainless steel reservoirs
- Nine (9) zero volume change ball valves
- Two (2) pressure transducers
- 20 MPa pressure capacity
- Integrated temperature control system inside the cabinet
- Includes software and automatic data acquisition for the determination of permeability



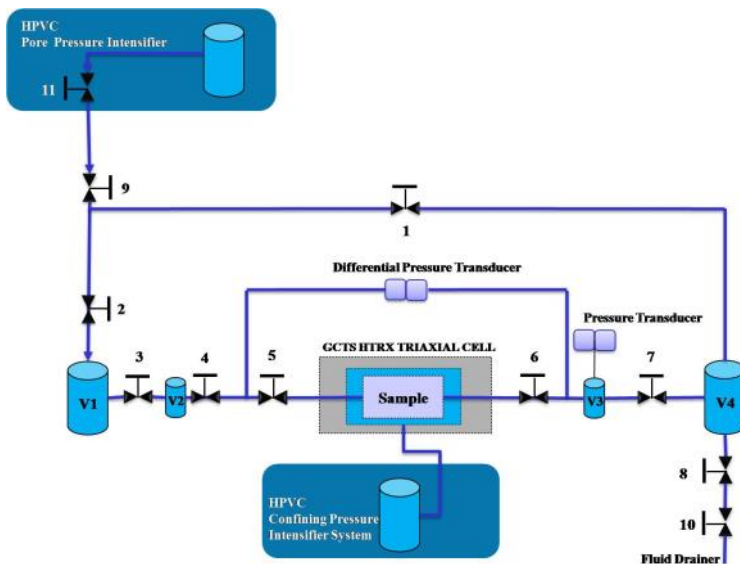
Description

The GCTS Fast Pulse Decay Permeability Apparatus (HPPD-20) is designed for measurement of permeability in microporous material, such as a gas shale and other reservoir rock, in order to determine the capacity and flow characteristics of the rock matrix. HPPD-20 is capable of measuring rock permeability less than 1 μ D (microdarcy).

HPPD-20 includes two large stainless steel reservoirs with 2,000 cc volume capacity each and two smaller stainless steel reservoirs each with 500 cc volume capacity. Also included are nine zero volume change ball valves and one needle valve for precise flow control.

The system components are secured in an insulated metal cabinet with valves and controls mounted on the front panel. The system also features precise temperature control inside the cabinet to eliminate any errors from temperature induced volume expansion or contraction of the fluid and gas inside the reservoirs.

HPPD-20 includes all necessary valves and fluid lines to perform the Fast Pulse Decay permeability tests when used with any of the GCTS triaxial systems.

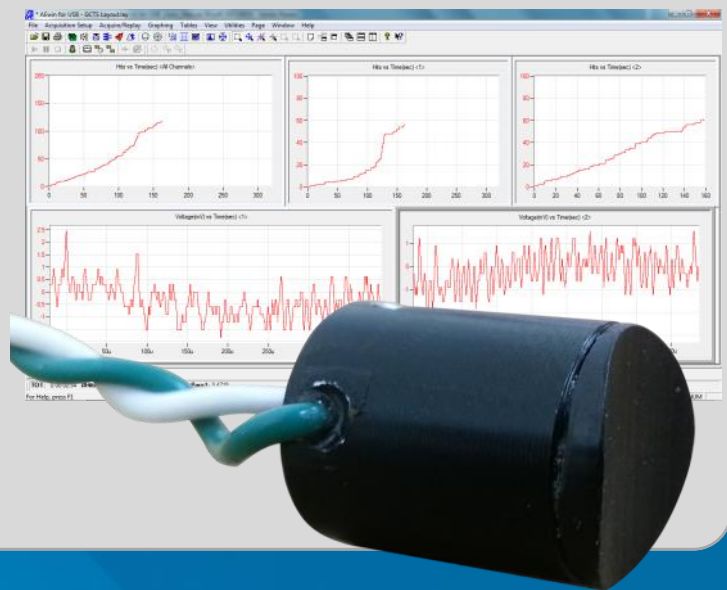


HPPD-20 System Schematic

Rock Testing Accessories

AE-HTRX Acoustic Emission Measurement

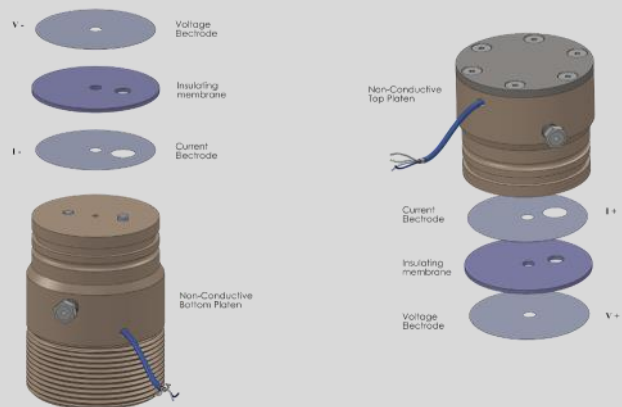
Acoustic emission testing is an optional fixture within most rock testing systems. GCTS has developed AE sensors that can be used inside a triaxial cell and mount directly on the specimen. This device can measure the acoustic emissions from rock testing specimens during loading and is available for a wide variety of specimen sizes.



RES-100 Electrical Resistivity

The GCTS Rock Resistivity System is designed to measure the electrical resistivity in cylindrical specimens under confined conditions. The electrical resistivity of rock is an important parameter and can be used in a variety of applications, including reservoir engineering, determination of oil locations, and calibration of resistivity field logs.

This system consists of four electrodes, which are isolated and sealed inside the non-conducting loading platens. These platens can be used within any GCTS triaxial cell for specimens up to 100 mm in diameter.



HPVS-400 Pore Fluid Transfer Cell

The GCTS Pore Fluid Transfer Cell can be used with the GCTS HPVC Pressure Intensifier to control the pore pressure, head pressure, or fluid pressure when using a corrosive fluid as the pore fluid. The transfer cell has a 400 cc volume capacity with an absolute pressure capacity of 140 MPa. It also has a 1,000 kPa differential pressure capacity.

Larger capacity transfer cells are available upon request.



Rock Testing Accessories

RDT Rock Direct Tension Test Fixture

The tensile strength of a rock is an important parameter for design and stability analysis for a range of cases, including understructure design. Although indirect tension tests are typically used to determine the tensile strength, a more robust approach would be to use a direct tension test. Any GCTS triaxial testing system can be configured with the direct tension accessories. Accessories are available for specimens up to 150 mm in diameter.



RIT-B Indirect Tension (Brazilian Test) Module

The GCTS RIT-B Rock Apparatus can be used to determine the indirect tensile strength of a rock or concrete specimen from the Brazilian test. This fixture meets the requirements presented in the International Society for Rock Mechanics standard.

This fixture is made of hardened stainless steel and can be used with any GCTS uniaxial, triaxial, or point load test frame. Fixtures are available for any specimen up to 150 mm diameter (although ISRM recommends only using a specimen with a diameter greater than 54 mm).



DSA-12 Differential Strain Curve Measurement Device

The GCTS Differential Strain Curve Measurement Device (DSA-12) is designed for testing cubical rock specimens under hydrostatic conditions in order to determine the in-situ stress state.

The DSA-12 comes with twelve high precision LVDTs vented for pressures up to 210 MPa with cables to connect to electrical feed-throughs inside the triaxial cell. It can accommodate cubical samples with side up to 50 mm in length and includes a stainless steel sliding rail for fast and precise positioning of the deformation sensors.



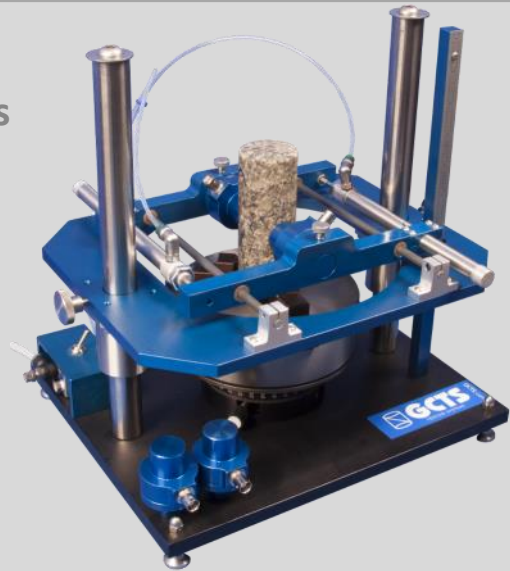
Rock Testing Accessories

CVA-100

Circumferential Velocity Anisotropy Apparatus

The GCTS Circumferential Velocity Anisotropy Apparatus (CVA-100) is used to determine the compression and shear wave velocities in rock core specimens in different orientations. The apparatus includes a turntable with Vernier scale for precise measurement of the angular orientation of the specimen. Pneumatic actuators are used to automatically clamp sensors onto the specimen.

A suitable ultrasonic measurement device, such as the GCTS ULT-200, is required for testing.



HTRX-HF

Hydraulic Fracture Platens

The GCTS Hydraulic Fracture Platens allows for the performance of fracture tests within any standard GCTS rock triaxial cells. These tests include hydraulic fracture, wellbore stability, and permeability tests. Tests can be performed with or without confining pressure.

Typically, fracturing pressure is ramped up at a constant fluid injection rate while injection pressure and radial strain are measured to determine the fracture stress. When coupled with the GCTS Acoustic Emissions (AE) system, it is possible to graph the AE versus the internal pressure to better detect the onset of fracturing.

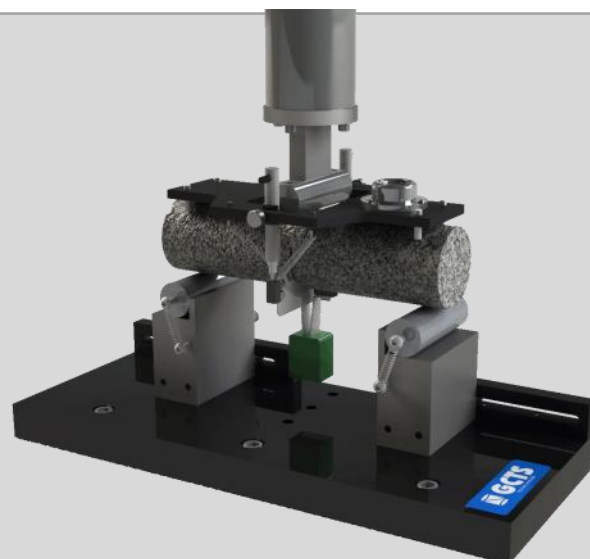


RFT-V100

Rock Fracture Toughness

The GCTS Rock Fracture Toughness Fixture is designed for testing cylindrical specimens under unconfined conditions to determine fracture toughness of rock materials. The fracture toughness allows for classification and characterization of intact rock with respect to its resistance to crack propagation.

This fixture has an adjustable base to allow for various specimen sizes. It also includes high-precision LVDTs and a clip gauge for strain measurements.



Rock Testing Accessories

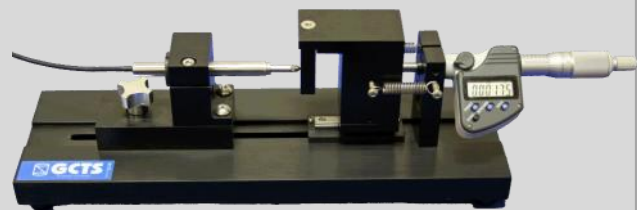
RFG-100 Specimen Flatness Gauge

The GCTS Specimen Flatness Gauge has a 200 mm x 300 mm x 50 mm thick granite base (grade A, ± 0.0001 inch accuracy) with dial gauge support for measuring flatness of specimens up to 200 mm in height. It includes a digital dial gauge with 0.01 mm (0.0005 inch) resolution.



DCD-25 LVDT Calibration Device

The GCTS LVDT Calibration Device provides a very simple and easy-to-use technique to accurately calibrate a wide variety of LVDTs. The DCD-25 features spring loaded linear displacement to prevent system compliance when reversing directions. The readout is available in both SI and English units. The device has an adjustable mounting bracket that can accommodate LVDTs of most sizes. It provides a calibration range of 25 mm (1 inch) with 0.001 mm (0.00005 inch) resolution.



Installation & Training

GCTS has a highly knowledgeable and professional staff who are capable of training your system operators regardless of the operator's level of familiarity with the systems.

Our training staff has decades of experience ranging from commercial to high-level research. They will guide your operators step by step to ensure they are fully comfortable with the entire testing process. Our team is also available to help with system installation and maintenance. Short courses are also periodically offered at GCTS facilities. Please contact GCTS to schedule an appointment.



Rock Testing Accessories

RCD-250

Pressure-Controlled Coring Machine

The GCTS RCD-250 allows for either force or stroke control, which optimizes feeding rates during coring. As a result, precise specimens are able to be made, even if the material is not homogeneous. Diamond coring barrels are available for different specimen types, diameters, and lengths.

- 150 to 4,200 rpm spindle speeds
- 1.5 HP motor
- Automatic down feed mechanism with 250 mm travel
- Stiff frame to eliminate specimen ridges
- Drilling rate controlled by pressure and speed

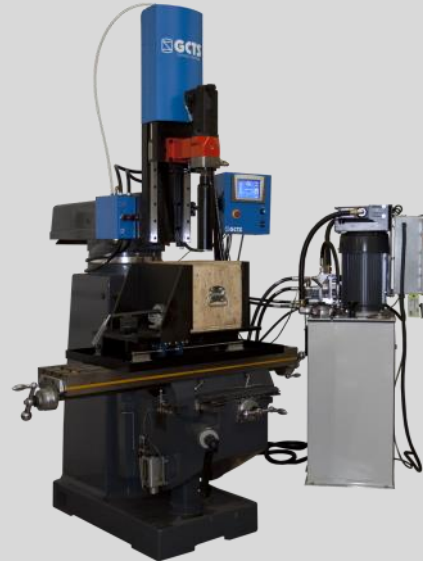


RCD-500

Pressure-Controlled Coring Machine

The RCD-500 Coring Device allows the drilling rate to be controlled by either force or pressure, eliminating the tendency for hard aggregates to move during coring. A hydraulic pump, water swivel, drip pan, vise table, and motor head are included.

- 150 to 1,000 rpm variable spindle speeds
- Automatic down feed mechanism with 310 mm travel
- Rigid multi-column drill support frame
- Many coring barrels available
- Measures torque, hang pressure, and RPM



RSG-075

Specimen Saw and Grinder

The RSG-075 is a two-in-one specimen preparation machine. It allows for both the cutting and grinding of rock, asphalt, or concrete specimens with a single machine. The system has a diamond saw blade powered by a 3/4 horsepower motor that can spin at up to 3,600 rpm. Specimens from 25 mm to 100 mm in diameter can be prepared in this system. A clear protective cover protects the user during preparation and the system allows for full specimen coverage on both the saw and the grinder with a single pass.



Rock Testing Accessories

RLS-100 Specimen Lab Saw

The RLS-100 can be used to cut rock, asphalt, or concrete specimens to the correct size. It features a 1 HP motor and power feed feature to ensure the sample is cut smoothly and evenly.

The RLS-100 can accept specimens with a diameter of up to 170 mm. It includes a metal hood with a viewing window to ensure safety while allowing the operator to visually manage the specimen.



RLS-200 Specimen Lab Saw

The RLS-200 can be used to cut rock, asphalt, or concrete specimens to the correct size. It features a 1 HP motor and electric feed control to ensure the specimen is cut at a constant rate.

The RLS-200 can accept specimens with a diameter of up to 150 mm. It uses an industrial diamond band saw to make precise cuts. The entire system has a clear enclosure, ensuring safety while being able to visually manage the specimen.



RSG-200 Specimen Grinder

The RSG-200 provides the final step to prepare test specimens with parallel and flat ends, according to ASTM and ISRM standards. The grinder is driven by a heavy-duty 2 HP electric motor. A diamond grinding cup wheel is provided, along with a custom stainless steel sample holder. GCTS offers sample holders for specimen diameters from 25 mm to 150 mm. The system has a built-in cooling circulator that cools the grinding cup wheel when preparing a specimen.



Digital Signal Conditioning and Control Units

SCON-1400/3000

- 16 or 24 bit A/D resolution and 100 kHz conversion rate with track-and-hold
- Adaptive digital servo control with Windows™ interface software
- Accepts Universal Digital Signal Conditioning modules for load cells, LVDTs (AC and DC), pressure sensors, or other analog input signals
- Internal and external temperature monitoring



Specifications

Specifications	SCON-1400	SCON-3000
Resolution	16 bit	24 bit
Max. Analog Inputs	4 AC, 4 DC/SG	23 Universal*
Max. Analog Outputs	4 (max. 2 servo outputs)	23 Universal*
Microprocessor	800 MHz	3.4 GHz
Maximum Control Loop Rate	4,000 Hz	10,000 Hz
Max. Power	0.4 kW	1.0 kW
Interface	Wi-Fi, USB, TCP/IP	Wi-Fi, USB, TCP/IP

Description

The GCTS SCON units are complete and self-contained modules that feature integrated microprocessor-based digital servo controllers, a built-in function generator, data acquisition, and digital I/O unit.

By utilizing state-of-the-art Universal Signal Conditioning boards, these systems can accept load cells, pressure transducers, LVDTs, thermocouples, or other analog input signals. Each channel features digital offset and gain and an anti-alias filter. This system also includes “track-and-hold,” which ensures the converted values from all attached sensors represent a single instant in time, eliminating any data skew from delays in the A/D converter.

The signal conditioning electronics are fully digital with settings directly manipulated by the software. Different equipment configurations are saved, which makes it very easy to change any sensor. The digital settings are also protected, eliminating the chance of accidental modifications to sensor calibrations and amplifications. In

addition, the systems incorporate automatic sensor recognition that will automatically load the correct sensor setup upon connecting or changing of a transducer. This system also allows for easy creation of virtual sensors based on existing ones with a smaller calibrated range.

Included with these systems is the GCTS CATS Standard Software that is compatible with all versions of Windows™. The standard systems also include calculated inputs from one or several analog channels that can be directly servo controlled or monitored in real time. Any system sensor can then be used to provide advanced servo control with on-the-fly, bumpless transfer, switching between any connected transducer or calculated inputs.

The newest SCON system, the SCON-3000, can wirelessly communicate with the controlling computer, allowing a user with a laptop computer to freely move around the laboratory while remaining in control of the testing system.

* Inputs and Outputs are interchangeable. The total number of inputs and outputs must be less than or equal to 23.

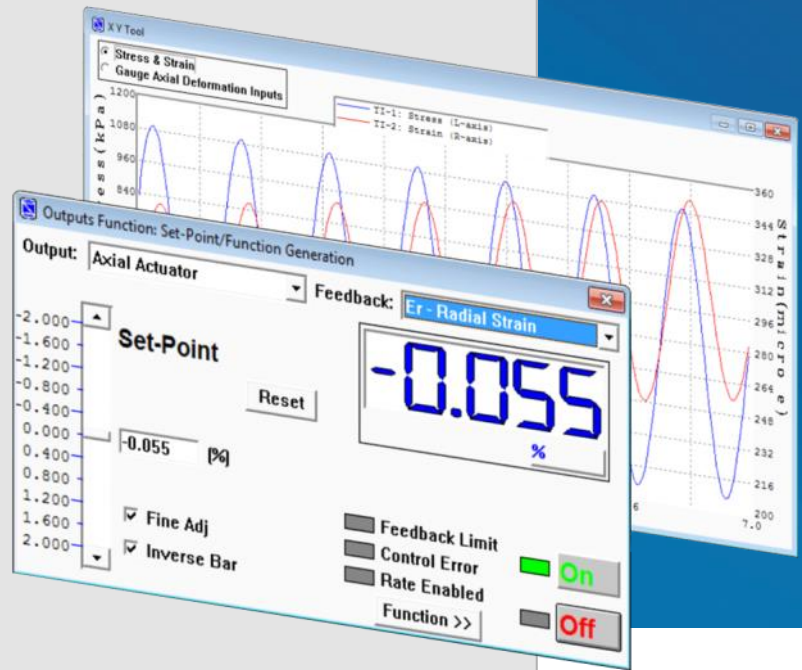


SCON-3000

Advanced Computer Aided Testing Software

WIN-CATS-ADV

- Advanced servo control from any system sensor or calculated variable
- On-the-fly, bumpless transfer and adaptive compensation
- Advanced digital temperature control
- Automatic frequency sweeps
- Independent and synchronized control of up to 10 outputs
- Complete units library including SI, Metric, English and user-defined units
- Real-time graphics of input channels
- Remote monitoring of test through networks
- Application programs include Direct Shear, Simple Shear, Triaxial, Resilient Modulus, Resonant Column, Hollow Cylinder, and more



Description

The GCTS Advanced Windows™ compatible software, coupled with SCON electronics, is the most advanced Geotechnical testing software available today. This software has simplified the operation of our instruments, allowing the user to directly program test-calculated parameters in the units of interest based on the specimen's dimensions. These parameters are calculated in real-time and are available for display, graph and control. Since GCTS signal conditioning electronics are fully

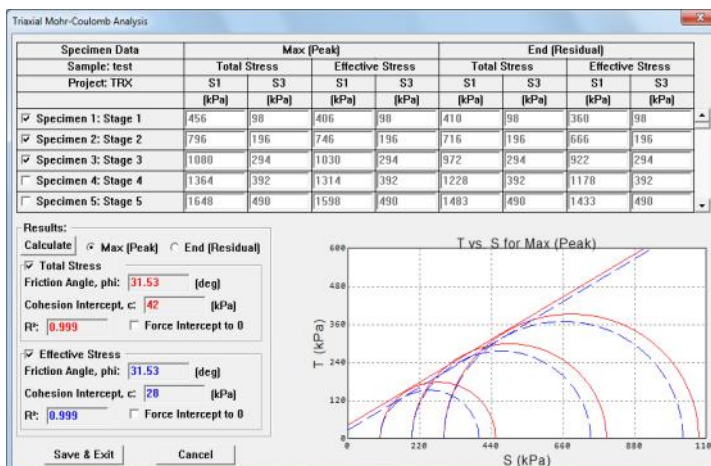
digital, optimization and calibration settings are software controlled. Alternate equipment configurations can be easily saved within the software so that the software can quickly recognize when a sensor has been changed and update with the new settings. All the offset and gain settings are managed by our computer software, reducing the possibility of accidentally changing the sensor calibration. The CATS software includes a digital filter on the sensor inputs to assist in

eliminating any noise from the digital signal.

All of our testing systems have been designed to take full advantage of our software and electronics so that all test stages can be automatically performed with minimal user intervention.

The Universal test module of the CATS Advanced software is a very versatile and powerful module that allows the user to establish any test procedure that they wish. It allows the user to simultaneously control up to 10 outputs (synchronous or asynchronous) in any phase, and allows the user to run unlimited phases or test programs.

GCTS offers many application software modules to perform specific test procedures (Triaxial, Direct Shear, Resonant Column, and more), and each module includes the Universal Module to program user-defined tests.

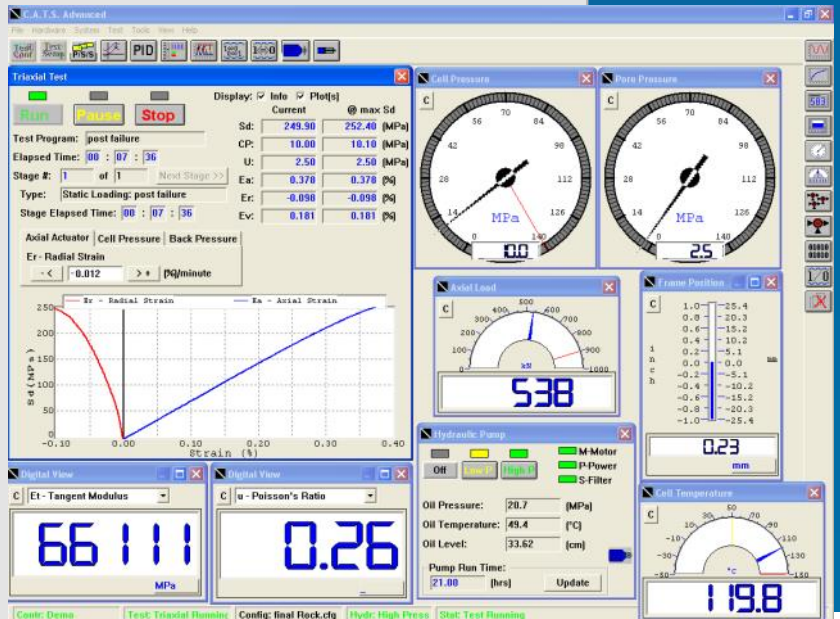


Automatic Mohr Circle Generation

Application Software Modules

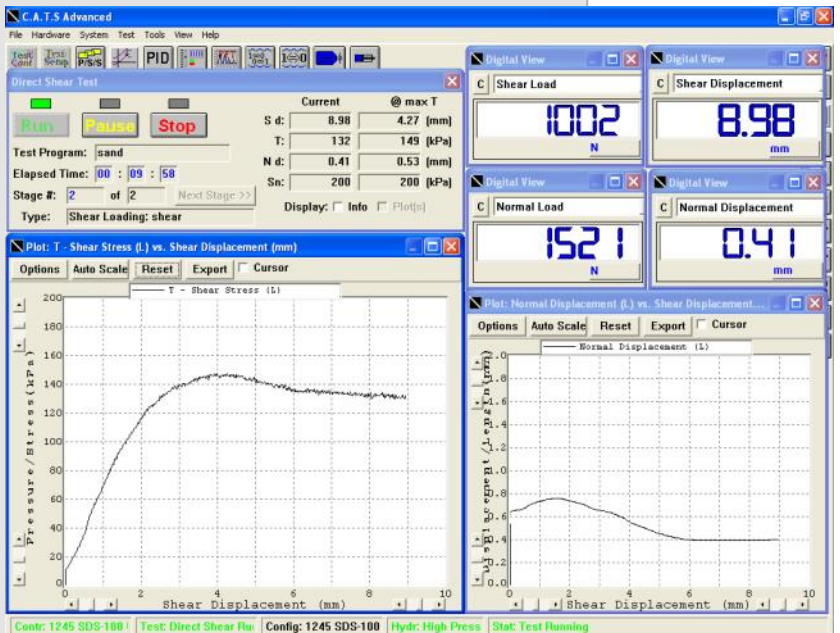
CATS-TRX-ROCK

The GCTS Rock Triaxial Software allows for the automatic test execution of rock triaxial tests under static or dynamic loading conditions. This software allows for the automatic control of all test stages, including saturation, consolidation, and shearing. B-values are automatically calculated for saturation, and consolidation can be performed under both isotropic and anisotropic conditions. Dynamic loading conditions can be used to test for liquefaction, resilient modulus, cyclic strength and more. Multi-stage testing can also be performed using this software. The software will automatically create a Mohr-Coulomb model after testing so results can be analyzed quickly.



CATS-DSH

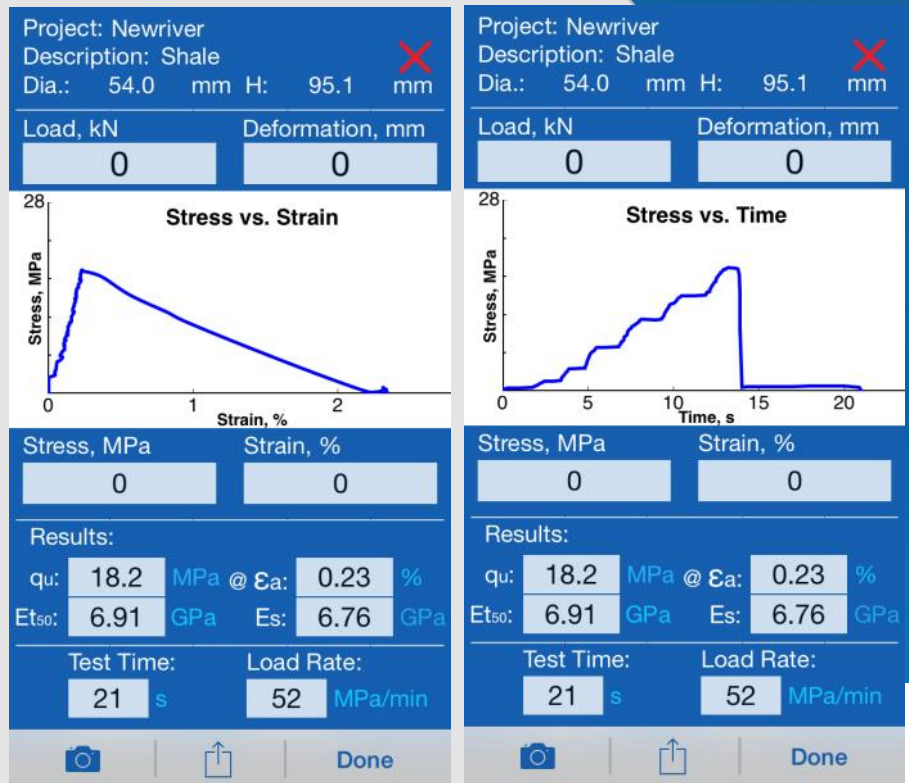
The GCTS Direct Shear Software allows for the complete automation of direct shear tests. This software automatically controls all stages of testing, including consolidation and shearing, and calculates test parameters in real-time for observation. The user can also easily program custom testing procedures. After testing, the system will automatically calculate the friction angle and cohesion intercept for the sample.



Applications for Mobile Devices

Mobile Device Applications

- Applications for Point Load Test, Unconfined Compression Test, and Brazilian Test
- Wirelessly connect with PLT-2W System
- Automatic specimen gauging
- Automatic recording of all test data
- Easily export data from application to email
- Compatible with ultrasonic measurement device



Description

The new GCTS Application for mobile devices is designed to be used with the GCTS PLT-2W for simplified point load, unconfined compressive strength, and Brazilian tests. These applications allow the user to be extremely productive during testing, as all test data is automatically calculated and recorded. This includes the specimen dimensions, applied load, specimen deformation, Point Load Strength Index, unconfined compressive strength, and tensile strength.

The application can be programmed to begin a new test immediately following a completed test. It can also be programmed to use specimens with the same dimensions, so the application would not need to remeasure a new specimen if it is being tested from the same core sample. All loading data is saved after performing each test, therefore the operator does not need to manually take measurements during the test. These features drastically increase productivity, as the operator can simply test rapidly without having to wait to manually take measurements.

After performing all tests, the application will automatically calculate the Point Load Strength Index, unconfined compressive strength, or the tensile strength of the material, depending on the test that was performed. All data can easily be sent directly from the application to the user via email as an Excel™ file.

Remote Monitoring App for iPhone & iPad

gTest

- Remote monitoring of test status in real-time
- Facilitates transducer and test setup
- Improves productivity and time efficiency
- Alerts if test system reaches warning/abort limits
- Secure encrypted data transmission
- Interface screens for triaxial, direct shear, creep and other GCTS CATS test modules



Description

GCTS has developed gTest, a remote monitoring application used to display test status in real-time. Current test information can be displayed digitally or graphically from any location. Sensor outputs, hydraulic power supply status, cycle count, and other general test progress can be accessed through a local wireless network or through the internet at remote locations.

The gTest app can be used to facilitate transducer setup where a view of the computer screen might be obstructed, as the test specimen may be placed inside an environmental chamber or some other hard-to-reach place. This application also allows the user to move freely around the testing system and check every one of the test sensors to ensure they are properly working and set at their right position. gTest improves productivity and eliminates requirement for a second person to set up and start a test.

The gTest app can be run from remote locations via the Internet, allowing the user to monitor test status without having to physically be in front of the test system.

This convenient application gives the user the freedom to go back to their office (or home) and be able to continuously monitor the test system performance. Test program sequencing mistakes and glitches in the hydraulic or pneumatic pressure supplies can be detected at their onset, allowing for timely corrective action. With this app, one person can manage multiple test systems even if they are located in different rooms.

This application is also a great tool for university labs. While inexperienced students are performing their own experiments, the lab instructor can easily monitor their progress. Test program errors and abnormal test results can be quickly noticed by a supervisor, prompting the student for appropriate action.

Transmitted data is securely encrypted, providing access to only pre-authorized personnel. If desired, the user can give access to GCTS support engineers allowing for remote service and real-time system optimization.

The gTest application software includes all of the different test mode interface screens offered by GCTS CATS test software modules. Each one offers an automatic screen setup to monitor and graph relevant test data for each particular test mode.



Notes

Useful Conversions

LENGTH

- 1 in = 2.54 cm
- 1 in = 0.0254 m
- 1 ft = 0.3048 m
- 1 ft = 30.48 cm
- 1 cm = 0.3937 in
- 1 m = 3.281 ft
- 1 km = 0.62137 mi

AREA

- 1 in² = 6.4516 cm²
- 1 in² = .00064516 m²
- 1 ft² = 0.09290 m²
- 1 ft² = 929.03 cm²
- 1 ft² = 144 in²
- 1 cm² = 0.155 in²
- 1 m² = 10.7638 ft²
- 1 m² = 1550 in²

VOLUME

- 1 in³ = 16.387 cm³
- 1 in³ = 16.387x10⁻⁶ m³
- 1 ft³ = 0.028317 m³
- 1 ft³ = 28316.8 cm³
- 1 ft³ = 1728 in³
- 1 cm³ = 0.06102 in³
- 1 m³ = 35.315 ft³
- 1 m³ = 61023 in³

FORCE / MASS

- 1 kg = 9.807 N = 0.009807 kN
- 1 kg = 2.205 lb
- 1 lb = 4.448 N = 0.004448 kN
- 1 kN = 224.82 lb
- 1 kN = 101.98 kg
- 1 ton (USCS) = 2000 lb = 8.896 kN
- 1 ton (SI) = 1000 kg = 2205 lb
- Note: g = 9.807 m/sec² = 32.2 ft/sec²

PRESSURE

- 1 kg/cm² = 98.07 kPa
- 1 psi = 6.895 kPa
- 1 psf = 0.04788 kPa
- 1 tsf (USCS) = 95.76 kPa
- 1 ton/m² (SI) = 9.807 kPa
- 1 kN/m² = 1 kPa
- 1 atm = 101.33 kPa
- 1 atm = 33.93 ft of H₂O

UNIT WEIGHT

- 1 kN/m³ = 6.366 lb/ft³
- 1 kN/m³ = 0.102 Mg/m³
- 1 lb/ft³ = 0.1571 kN/m³
- 1 Mg/m³ = 9.807 kN/m³
- 1 ton/m³ (SI) = 9.870 kN/m³
- 1 kN/m³ = 0.102 ton/m³ (SI)
- 1 kN/m³ = 0.003183 ton/ft³ (USCS)

METRIC PREFIXES

- micro (μ) - 10⁻⁶
- milli (m) - 10⁻³
- centi (c) - 10⁻²
- deci (d) - 10⁻¹
- hecto (h) - 10²
- kilo (k) - 10³
- Mega (M) - 10⁶
- Giga (G) - 10⁹

COMMON EQUIVALENTS

- 1 ft³ of water = 62.4 lbf
- 1 gal of water = 8.34 lbf
- 1 m³ of water = 1000 kg
- 1 m³ of water = 9.81 kN
- γ_{concrete} ≈ 150 lb/ft³
- 1 kPa = 10.2 cm of water
- 1 gal (USCS) = 231 in³

TEMPERATURE

- °F = 1.8 (°C) + 32
- °C = (°F - 32) / 1.8
- °R = °C + 459.69
- K = °C + 273.15



Contact Information

Headquarters

6103 S. Maple Ave.
Tempe, Arizona 85283
U.S.A

Mail

P.O. Box 23686
Tempe, Arizona 85285
U.S.A

Tel 480.456.0110
Fax 480.456.4727
sales@gcts.com



www.gcts.com

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