

# ADVANCED GEOTECHNICAL TESTING SYSTEMS



- Ultra HP-HT Gas Triaxial System
- Polyaxial Rock Testing System
- Modular Rock Shear Testing System
- High Pressure Syringe Pumps
- Columnless Cyclic Triaxial Testing System
- Large Direct Shear Test Apparatus
- Bishop Ring Shear Apparatus
- Resonant Column Test Apparatus
- Geoprobe-Direct Push Rig
- ARES II Resistivity Meter
- ECORE-LIBS Core Scanner
- Multi-Sensor Hyperspectral Core Scanner
- Wireless Structural Monitoring

# Advanced Rock Testing Systems



## ULTRA HP-HT GAS TRIAXIAL SYSTEM

In the 1960s-80s, Prof. Mervyn Paterson at the Australia National University (ANU) developed a unique gas-media deformation apparatus.

In 2018 APS-Wille Geotechnik® presented a new modified and upgraded generation of this sophisticated high pressure high temperature internally heated pressure vessel system aiming to perform complex rock triaxial experiments at elevated P-T conditions. This triaxial system for simulation of axial stresses down to approximately 13 km, is using gas as pressurizing medium.

By combining high technical performance with versatile measurement capability, this upgraded triaxial system provides researchers with a powerful platform for studying rock deformation, fluid–rock interactions, and subsurface processes relevant to geotechnical engineering, geothermal energy, hydrocarbon exploration, and deep underground storage applications.

## SALIENT FEATURES

### ULTRA HP-HT GAS TRIAXIAL SYSTEM

- Max. Axial Load: Up to 2000 kN
- Max. Cell Pressure: Up to 600 MPa
- Max. Temperature: 800 °C
- Sample size(diameter): 24 mm
- Sample height: 50 mm
- Pore Pressure: 300 MPa

### POLYAXIAL ROCK TESTING SYSTEM

- Max Static Load: Up to 2000kN
- Min. Velocity: 0.01mm/min
- Max. Velocity: 90 mm/min
- Piston Stroke: 100 mm (+/-50 mm)
- Force Accuracy: 0.1% F.S
- Sample Size/s:  
300x300x300mm  
200x200x200mm  
100x100x100mm or smaller

## POLYAXIAL ROCK TESTING SYSTEM

This unique experimental testing system is a customized solution used to study the behaviour of rock under various dimensional and compressive stress regimes ( $\sigma_1 \neq \sigma_2 \neq \sigma_3$ ).

This fits to the research goals of geothermal energy researchers, hydrologists, petroleum reservoir engineers and researchers in the mining, geophysics and geotechnical sectors.

The system is capable of testing a wide range of materials from granite to mudstones and also for post-failure regime of high-strength brittle rocks.

Polyaxial rock testing systems are designed to induce stress on cubic samples via three independent controlled principal axes ( $\sigma_1 \neq \sigma_2 \neq \sigma_3$ ) up to 1200kN or higher stresses on request





## MODULAR ROCK SHEAR TESTING SYSTEM

The combined modular rock direct shear and triaxial test system is designed to determine the shear strength of intact, joint rock or concrete samples.

The machine has a high stiff frame which consists of 4 stiff columns and two actuators for vertical force and shear force, combined in a special configuration to avoid friction and torque to determine the shear strength and creep properties of rock samples, concrete, as well as any solid material.

The device is suitable for cylindrical, prismatic or irregular shaped pieces of solid or discontinuous rock cores. The system uses two independent servo-hydraulic actuators to apply axial and shear load to samples with high accuracy.

This device allows for the testing of rock samples under both shear and triaxial loading conditions.

# Advanced Rock Testing Systems

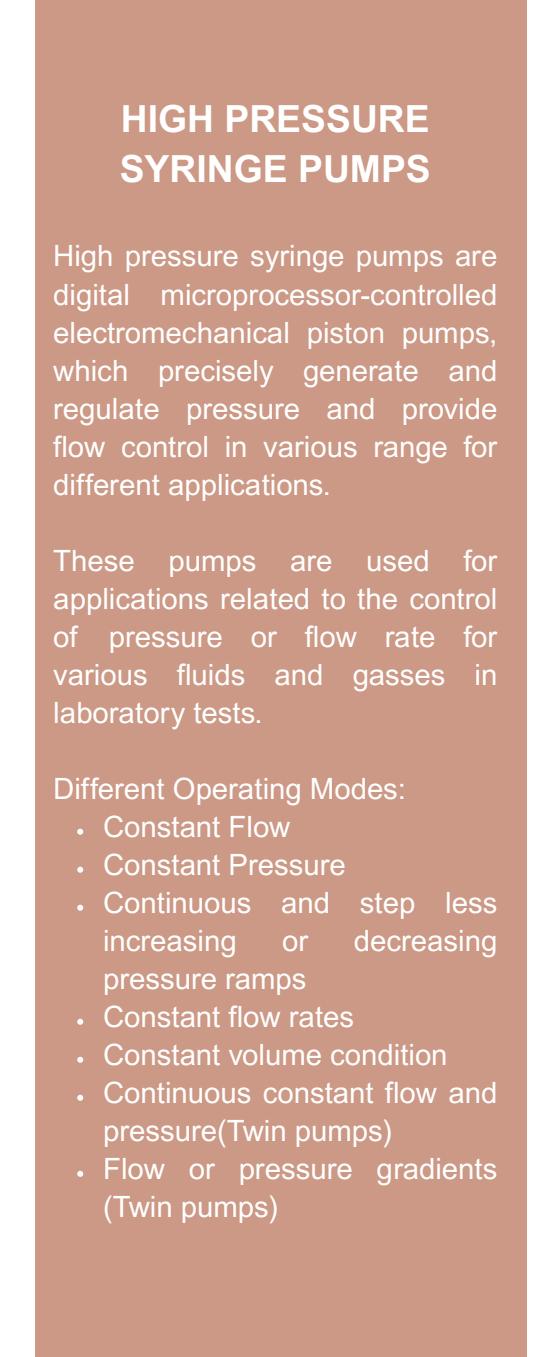
## SALIENT FEATURES

### MODULAR ROCK SHEAR TESTING SYSTEM

- Load type: servo-hydraulic
- Axial force: up to 5000 kN
- Shear force: Up to 500 kN
- Specimen Size: up to 300×300×300 mm for shear tests, Up to 100 mm diameter for Triaxial tests
- Accuracy: 0.1%
- Settlement, resolution: 50/0.001 mm
- Shear displacement: 50 mm/100 mm
- Cyclic Load: on request

### HIGH PRESSURE SYRINGE PUMPS

- Pressure range: From 10 bar up to 4000 bar
- Volume range: 46 ml up to 1155 ml
- Material of cylinder: Stainless Steel / Hastelloy
- Pressure accuracy: 0.1% F.S
- Flow accuracy 0.0002 ml/min
- Type of Media: Water, oil, gas, CO<sub>2</sub>, H<sub>2</sub> and etc.



## HIGH PRESSURE SYRINGE PUMPS

High pressure syringe pumps are digital microprocessor-controlled electromechanical piston pumps, which precisely generate and regulate pressure and provide flow control in various range for different applications.

These pumps are used for applications related to the control of pressure or flow rate for various fluids and gasses in laboratory tests.

### Different Operating Modes:

- Constant Flow
- Constant Pressure
- Continuous and step less increasing or decreasing pressure ramps
- Constant flow rates
- Constant volume condition
- Continuous constant flow and pressure(Twin pumps)
- Flow or pressure gradients (Twin pumps)

# Advanced Soil Testing Systems



## LARGE DIRECT SHEAR TEST APPARATUS

The automated large direct shear apparatus has been designed and manufactured according to latest version of current testing standards (ASTM, ISO, EN and DIN) and manufactured by highest quality of mechanical and electronic parts. This excellent quality makes it unique to produce the best repeatable test results.

The device determines the internal friction of construction materials e.g. soils, aggregates, gravels, geomembranes, geotextiles, GCL (Geosynthetic clay liner), recycling rubble Brick rubble, Colliery spoils and industrial slag.

The interface friction parameters between different construction material could be also determined by the device e.g. geotextile/soil, asphalt/concrete and geogrid/soil etc.

## SALIENT FEATURES

### LARGE DIRECT SHEAR TEST APPARATUS

- Load type: Electromechanical
- Normal force: 60 / 100 / 125 /200 / 250 kN
- Shear force: 60 / 100 / 125 /200 / 250kN
- Sample Size: 300x300 mm 500x500 mm

### COLUMNLESS CYCLIC TRIAXIAL TESTING SYSTEM

- Axial load: Up to 60 kN
- Cyclic frequency: Up to 15 Hz
- Confining pressure: Up to 5000 kPa
- Sample Size(diameter): Up to 300 mm
- Confining pressure frequency: Up to 5 Hz

## COLUMNLESS CYCLIC TRIAXIAL TESTING SYSTEM

The high-quality column-less loading system applies the static and cyclic loads from the bottom of the Triaxial cell. The top of the cell is free operating space to facilitate installation of sample or local strain measuring devices.

The Triaxial cell is connected to a lifting mechanism that lifts the cell wall up and gives the easiest way for the operator to handle the cell.

This loading system is specially designed and configured for cyclic Triaxial tests and use compensated ram technology.

The system includes a special load pistol construction to compensate cell-pressure changes affected by the volume change of the movement of piston in and out of the triaxial cell.





## BISHOP RING SHEAR APPARATUS

This advanced Bishop Ring Shear device is an advanced torsional shear apparatus, developed on the foundational concepts established by Bishop and his team in 1971 used to investigate post-peak shear resistance and shear displacement behavior, especially in clayey soils affected by slow landslides

This stand-alone test apparatus is a robust construction device including 2 high end electromechanical force actuator which are used for normal stress and shear stress.

The wide column spacing enables the accommodation of large shear boxes with sample sizes up to 200 mm O.D. and 150 mm I.D. The frame has high stiffness to reduce deflection and vibrations, which could influence the accuracy of measurements during repeated loading tests.

The device is capable of determining the interface friction angles between soil and displacement piles (ICP method).

# Advanced Soil Testing Systems

## SALIENT FEATURES

### BISHOP RING SHEAR APPARATUS

- Axial Load: Up to 20 kN
- Shear Torque: Up to 1100 Nm
- Angle of rotation: Unlimited
- Rotational rates: 4500° – 0.00001°/min
- Sample Size(Outer): 100 / 150 / 200 mm

### RESONANT COLUMN TEST APPARATUS

- Axial Load Type: Isotropic or Anisotropic
- Cell pressure: Up to 2000 kPa
- Torsional Frequency: Up to 3000 Hz
- Sample Size: 150 mm up to 250 mm

## RESONANT COLUMN TEST APPARATUS

This device is a high-quality apparatus for measuring the low-shear strain (less than 0.001%) or elastic modulus and damping properties of materials (e.g., wide variety of soils, rocks, Asphalt, etc.) for solid- or hollow cylindrical samples under confined condition.

It works based on the theory of wave propagation and used to vibrate the top of the soil specimen. The device can work under two different boundary conditions, so called free-free and fix free conditions, which depends minimum desired strain.

The device can run the tests on soils, including mixtures of clays, silts and sands, and other materials (excluding Rock), and also possible to do test on organic soils (soft soil).



# Field Testing



## GEOPROBE - DIRECT PUSH RIG

Geoprobe® environmental drill rigs are built to make subsurface sampling faster, safer, and cleaner. It combines direct push, rotary, and sonic drilling in one system, so you can handle many site conditions with a single rig.

The Geoprobe 7822DT is a versatile, compact drill rig designed for both direct push and rotary drilling including auger, hollow-stem, rock coring etc. It combines high power with a slim profile so it can be used in tight or restricted spaces, urban environments, and rugged terrain.

Its compact footprint and wide track base allow for exceptional maneuverability in confined or remote locations, making it ideal for a variety of challenging job sites.

Engineered for minimal maintenance, it reduces downtime and maximizes time spent on profit-driving activities.

## SALIENT FEATURES

### GEOPROBE - DIRECT PUSH RIG

- Combines direct push, rotary, and sonic drilling in one system.
- Can do Direct Push sampling / hammering (environmental / soil / subsurface investigations)
- Converts between direct push and rotary methods.
- Two-speed and four-speed rotary heads available for different torque / speed needs
- Good maneuverability

### ARES II RESISTIVITY METER

- 850 W - 2000 Vp-p, 5A Transmitter with Parallel Power
- Booster Capability for all Multi Electrode and Manual Modes
- 10-channel Receiver with up to 20 Adjustable IP Windows
- 2D/3D Resistivity & IP Tomography VES, RP, SP Measurements Continuous or Timed Survey
- Remote Control Option

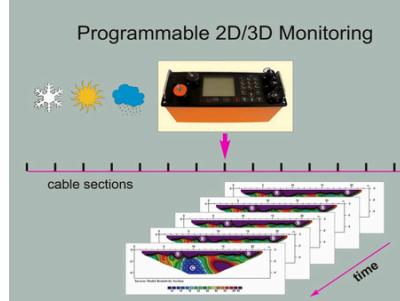
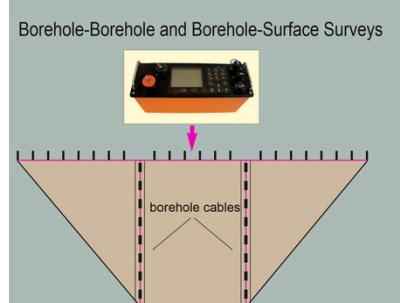


## ARES II RESISTIVITY METER

ARES II represents a well-equipped Resistivity & IP imaging system. Its advantages can be applied especially for large 2D and 3D surveys (operating up to 65,000 electrodes), for continuous survey from water level and for programmable monitoring of structures.

One ruggedized weatherproof unit integrates a powerful 850W - 2000 Vp-p, 5A transmitter and a sensitive receiver completed with a rich support for a variety of measuring methods like 2D/3D/4D Resistivity & IP Tomography, VES, RP, SP Measurements, Continuous or Timed Survey.

It also has an easy control unit with high resolution LCD and easy real time horizontal and vertical data consistency checking. The system can be equipped with Active Multi-Electrode Cables, Passive Cables with Switch Box Roll-Along Possibility.





## MULTI-SENSOR HYPERSPECTRAL CORE SCANNER

This is a fully autonomous multi-sensor scanning platform designed for continuous drill core scanning and handling.

Developed in close collaboration with professional geoscientists and based on the latest imaging technologies, it produces high-quality imagery data in a user-friendly format that can be readily imported into subsurface modeling programs.

Built with our proprietary state-of-the-art hyperspectral imagers, the system can deliver exceptional performance directly on site or in a laboratory with a variety of different modular configurations readily available.

It allows for the integration of up to 7 optical sensors, offering the most comprehensive set of imaging tools and providing an extensive map of the mineralogical landscape with unparalleled accuracy.

Three modular system options are available: Compact, U-Shaped and Container to accommodate all mining industry needs.



## SALIENT FEATURES

### MULTI-SENSOR HYPERSPECTRAL CORE SCANNER

- Up to 7 optical sensors and a bar core reader
- Fast scanning rate over 1200 m of core per 8-hour shift
- No sample preparation needed
- Range from 400 nm to 11.5 micron of scanning
- Modular systems

### ECORE- LIBS CORE SCANNER

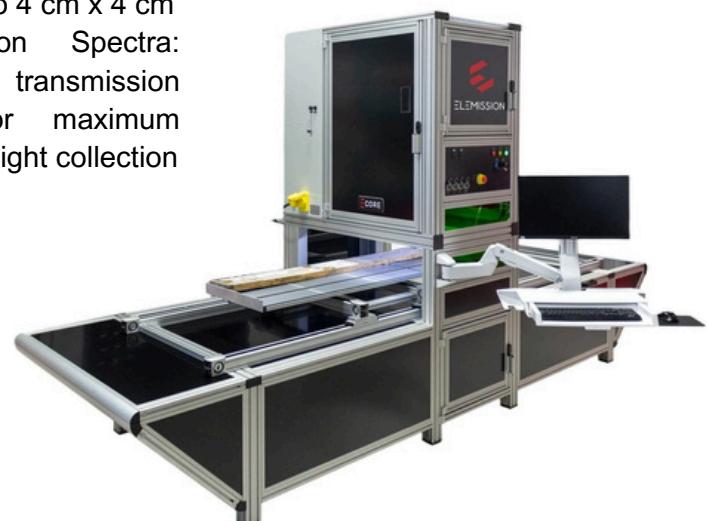
- Spatial Resolution: Factory set ~ 50 micrometers
- Acquisition Rate: 2000 measurements per second (2000 Hz)
- Spectral Range: 220 nm to 930 nm
- Surface Sampling: High speed all optical scanning of the surface 40 mm x 40 mm @ 2000 Hz
- Scan Speed: 1 cm<sup>2</sup> at 50 micron resolution in less than 30 seconds
- Scan Axes: Z-stage for focus adjustment, XY-Stage for drill core scanning
- Sampling Visualisation: 532 nm green laser pointer for scanning area preview up to 4 cm x 4 cm
- Plasma Emission Spectra: Achromatic High transmission fiber optics for maximum plasma emission light collection

## ECORE- LIBS CORE SCANNER

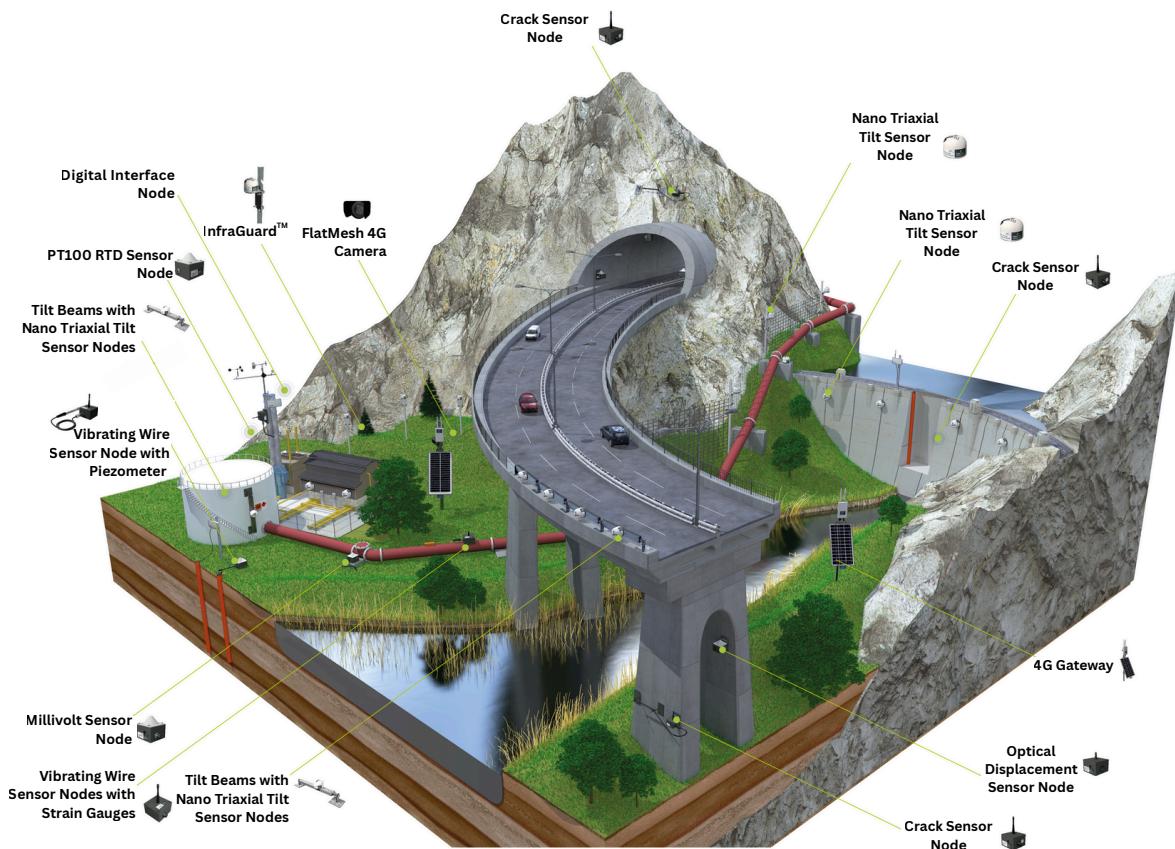
The ECORE machine, powered by advanced Laser-Induced Breakdown Spectroscopy (LIBS) technology, is a cutting-edge solution for rapid, accurate, and non-destructive elemental analysis. It delivers multi-elemental results within seconds with exceptional sensitivity, detecting trace elements at ppm to sub-ppm levels across the full periodic table, from hydrogen (H) to uranium (U).

Designed for versatility, the ECORE machine requires minimal sample preparation and can directly analyze solids, powders, liquids, and gases. Its portable and field-deployable design makes it ideal for applications in mining, geology, metallurgy, and environmental monitoring. Consuming only micrograms of material per analysis, it ensures reliable results while preserving valuable samples.

The ECORE machine is eco-friendly and economical, operating without chemicals or consumables. Extensively proven in mineral exploration and critical mineral analysis, it delivers quick, accurate, and dependable real-time results.



# Wireless Structural Monitoring



Intelligent monitoring enhances safety by providing real-time visibility, faster reporting, and quick insights before teams reach the site, enabling timely decisions and improved protection of people and infrastructure.

- Bridge Monitoring: Continuous structural data from remote sensors
- Rockfall Monitoring: Sudden event detection with immediate alerts and photos
- Tunnel Monitoring: Use remote monitoring technology before, during and after construction
- Landslide Monitoring: Get immediate insight of an event at a remote site

## SALIENT FEATURES

- Communication Network Required: FlatMesh 2.4 GHz
- Compatible Tilt sensors and Camera: FlatMesh Triaxial Tiltmeters, FlatMesh Nano Triaxial Tiltmeters, 4G Camera
- Expected Latency: 1-5 min
- Cellular Network Requirement: 3G/4G Cellular network
- Sudden Movement Detection Threshold:  $1^{\circ}/\text{sec}$
- Maximum Increased Sampling Rate: 1 min
- Maximum Number of Nodes in Network (including cameras): 80
- Alert Levels: 3 levels on either side of baseline

Reliable, Continuous Data - High-precision triaxial tilt sensors continuously monitor shallow ground movement, with regular data uploads. If an alert is triggered, the system immediately uploads data, overriding the pre-set sampling schedule.

Near Real-Time Alerts - Automated notifications via SMS or email help you respond quickly before movement becomes critical.

Intelligent Event Detection - Multi-level alerts based on severity of slope movement and on-site imagery for immediate verification.