

True Triaxial Apparatus (GDSTTA)



Overview: The GDS True Triaxial Apparatus (GDSTTA) has the defining characteristic that, unlike conventional triaxial apparatus, all three principal stresses can be controlled independently, rather than just two in a conventional triaxial system. This allows a wider range of complex stress paths to be performed. This dynamic cyclic system is powered by advanced electro-mechanical actuators and is an extremely sophisticated research tool.

Vertical and one horizontal axis are loaded via the dynamic actuators (axis 1 and 2), stress control is provided for the 2nd horizontal axis, (axis 3) via cell pressure.

Key Features:

Benefits to the User:

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|--|--|
| Stress or strain is applied to a 75mm x 75mm x 150mm sample independently on three axes: | Two pairs of matched dynamic rams for axes 1 and 2, and a confining fluid provides pressure for the 3 rd axis on load readings. |
| Ram specification: | Each ram has its own internal submersible load cell and displacement transducer to ensure friction effects are minimised. |
| Electro-mechanical actuators as standard: | Electro-mechanical actuators provide an easier to use and environmentally friendly solution for accurate testing to 5Hz. Electro-mechanical actuators do not require a hydraulic power pack to be present, hence no requirement to service a powerpack or to protect system users from noise generated by a powerpack. |
| Sample preparation: | Full sample preparation equipment for cohesive and non-cohesive samples is provided with the system including a specially designed soil lathe for producing cuboidal samples. |

Upgrade Options:

Bender element system (vertical, horizontal, S and P waves), LVDT local strain, unsaturated testing and dynamic cell pressure (5Hz).

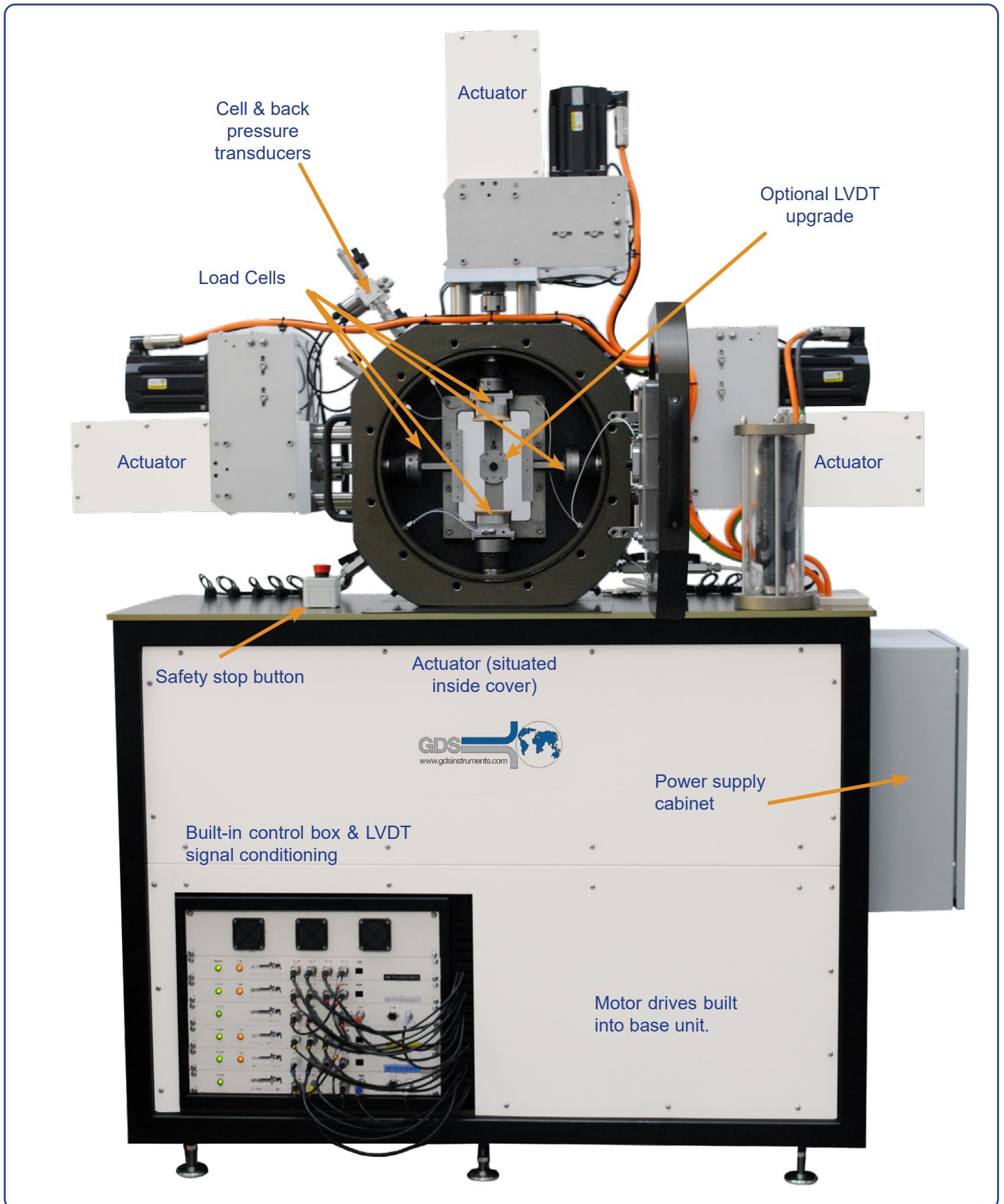
Tests that can be Performed:

Fully independent control of axis 1 and 2 for load, stress, displacement and strain, stress control on axis 3 via cell pressure.

Technical Specification:

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|-----------------------------------|---|
| Data Acquisition: | 16 Bit, 16 Channel |
| Cell Pressure Range (MPa): | 1 |
| Load Range (kN): | 20 (Electro-mechanical) |
| Operating Frequency (Hz): | 5 |
| Sample size (mm): | 75x75x150 |
| Dimensions (mm): | 2250 tall, 1750 wide, 550 deep. |
| Power: | 3-Phase Power supply required: 380V-415V, 50Hz/60Hz. Maximum current capacity 64 Amp. Note: GDS provides a 3-phase power socket with neutral and earth for wall mounting. |

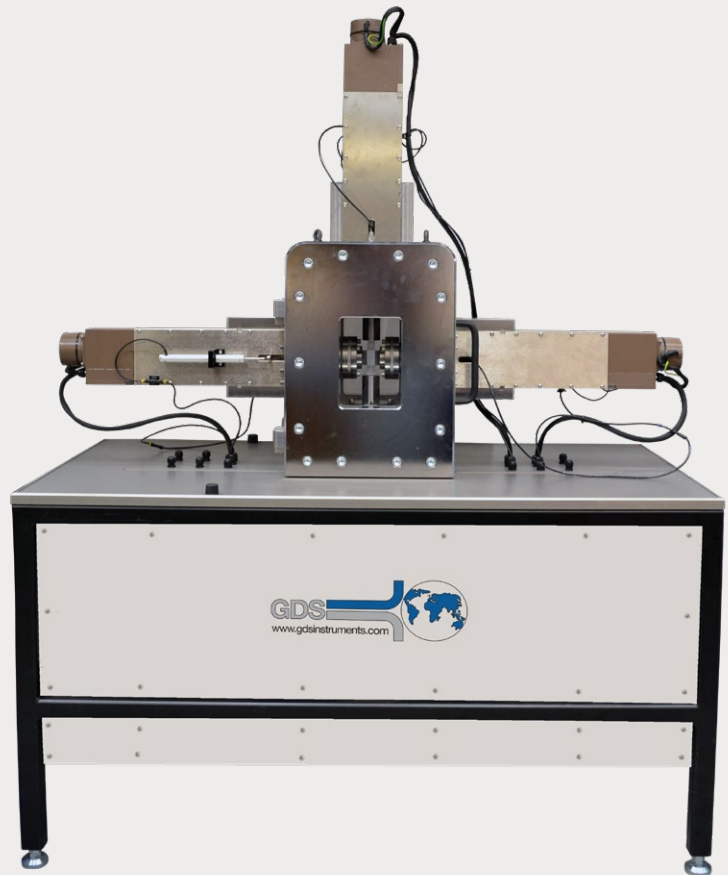
Fig 1. Key features of GDS Electro-mechanically actuated GDSTTA



GDS Static True Triaxial Apparatus

The Static True Triaxial Apparatus works in the same way as the dynamic version of the GDSTTA, with the exception of the actuators, which apply a static pressure. It consists of two vertical and two horizontal servo-motor actuators and two high-performance pressure controllers to apply confining pressure and pore pressure respectively. The axial stress, horizontal stress, confining pressure and pore pressure can be controlled independently.

The stiffness of the loading frame is evaluated as 1GN/m, and the actuators are designed to produce a force up to 32kN. The confining pressure and pore pressure are both 2MPa. The maximum dimension of the specimen is 75mm×75mm×150mm. Four LVDT's are used to monitor the displacement of the actuator and specimen deformation. Four internal encoders are configured to provide maximum accuracy and resolution, which can also be used to verify the sample LVDT's for additional test confidence.



GDSLAB & GDSTTA Control Panel

GDSLAB is the control and data acquisition software for geotechnical laboratory applications. GDSLAB starts with a core application known as the kernel. The GDSLAB kernel allows for data acquisition from your hardware, but no test control. Simply add the appropriate module or modules to complete the test suite functionality you require. GDSLAB is compatible with all existing GDS equipment and furthermore key hardware from other manufacturers.

The GDSTTA actuators may be individually positioned via the GDSTTA Control form within the Object Display to allow correct system configuration before and during specimen installation in the triaxial cell.

The Position Limits and Load Limits allow the user to specify upper and lower bounds for the displacement and load readings of each individual actuator during system operation. If a value is entered for a specific limit and the checkbox is ticked, then actuator movement will be halted by the system firmware if the limit is reached or exceeded at any point. Note these limits are superseded by the maximum and minimum system limits, as displayed underneath the user-specified limit input boxes.

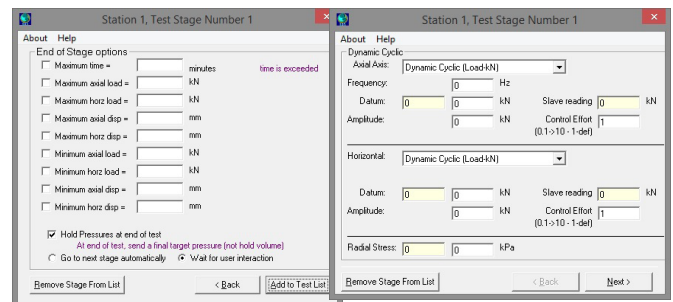


Fig 3. Shows GDSTTA Advanced Loading module forms

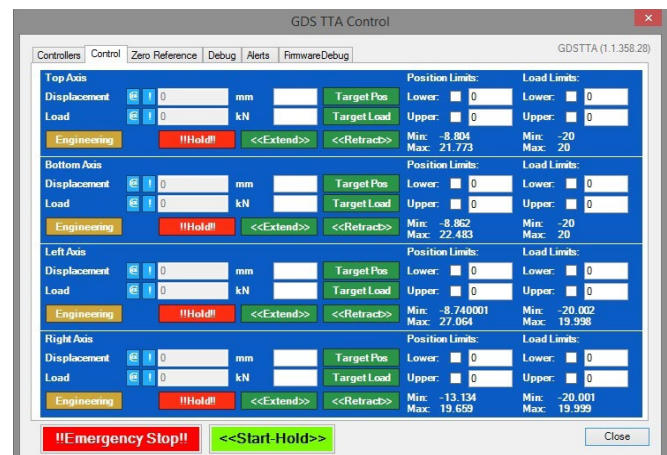


Fig 4. Control tab within the GDSTTA Control form.

ELDCS Acquisition Pad Used in GDSTTA



Overview: The ELDCS is our Enterprise level Analogue Acquisition and Control System designed for mid range dynamic testing and control. The ELDCS has been fully designed and developed by GDS' in-house engineering team and fits neatly as a lower cost version of the ADVDCS v2, with many of the same features that would be expected from a high level dynamic control system, but with a more economical price point.

The ELDCS provides 4 channels of ultra-high resolution 24-bit data and a single additional incremental quadrature input channel. The 4 channels of fixed-gain inputs can be customised at the factory to enable any transducer in the GDS range to be connected via the industry standard DIN connector. Multiple ELDCS boxes can be joined via the CAN connector to provide synchronised data acquisition and control.

A standard USB Interface provides direct PC connectivity and is fully supported by the GDSLab Test Software allowing seamless integration into new and existing test setups.

Technical Specification:

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|--|---|
| Connection to PC: | USB |
| Acquisition Channels: | 4 Analogue + 1 Quadrature Decoder |
| Control Channels: | 1 Analogue |
| Multi Box Capability: | x4 |
| Max Number of Channels: | Up to 16 analogue + 4 quadrature channels with synchronised data acquisition |
| Sample Rate: | 500Hz |
| Resolution: | 24 bit, 16,777,216 |
| Gain Ranges: | 8 (preconfigured at factory) |
| Description: | Enterprise level solution for dynamic acquisition and control. |
| Voltage Resolution: | ~ 0.000001 mVolts (1 nanovolt) |
| Voltage Input Type: | Fully Differential, Balanced Precision Inputs with Integrated Signal Conditioning |
| Transducer Excitation Voltage: | Differential, Fixed Precision +/-5V, Independent (not Ganged), Ratiometric Excitation |
| Number of Input Ranges: | Pre-Configured Single Fixed Gain per Channel. Each channel can be individually customised at the factory to meet application requirements from +/- 10mV to +/- 10V. Standard setup is 1 channel +/-10V, 2 channels +/- 200mV, 1 channel +/- 30mV. |
| Excitation Fault Tolerance: | Independent Per Channel, if any channel is shorted the other channels will continue to operate normally |
| Current Input Mode: | Yes - Via resistor fitted in cable termination (different ranges possible) |
| Differential Measurement Range: | -10mV...+10mV to -10V...+10V for balanced differential signals |
| Transducer Calibration: | Linear |
| Data Acquisition Options: | Digital filtering for noise reduction |
| Digital Control: | 500 Hz 32-bit floating point control loop |
| Analogue Control: | Support for Analogue motor drives only |
| Compliance Estimation: | Set by user |
| Adaptive Control: | Cycle-by-Cycle Reference Adaptation |
| Custom Waveforms: | Repetitive custom waveforms with 256 points per cycle. Waveform streaming direct from file. |
| Sample Docking: | Manual |
| Display and Monitoring: | Data acquisition in GDSLab via USB interface, High resolution real time graphs |
| Software: | GDSLAB |
| System Characteristics: | 40MHz 16-Bit Digital Signal Controller with Analogue Control Outputs |
| Minimum System Requirements: | OS: Windows 7 or later, CPU: 1.5 GHz or higher, Memory: 2 GB, USB 2.0 |

Why Buy GDS?

GDS have supplied equipment to over 86% of the world's top 50 Universities:

GDS have supplied equipment to over 86% of the world's top 50 Universities who specialise in Civil & Structural Engineering, according to the "QS World University Ranking 2020" report.

GDS also work with many commercial laboratories including BGC Canada, Fugro, GEO, Geolabs, Geoteko, Golder Associates, Inpijn Blokpoel, Klohn Crippen, MEG Consulting, Multiconsult, Statens Vegvesen, NGI, Ramboll, Russell Geotechnical Innovations Ltd, SA Geolabs, SGS, Wiertsema and Partners to name a few.

**TOP
50**

Would you recommend GDS equipment to your colleague, friend or associate?

100% of our customers answered "YES"

Results from our post-delivery survey asked customers for feedback on their delivery, installation (if applicable), supporting documentation, apparatus and overall satisfaction with GDS. The survey ran for two years.



Made in the UK:

All GDS products are designed, manufactured and assembled in the UK at our offices in Hook. All products are quality assured before they are dispatched.

GDS are an ISO9001:2015 accredited company. The scope of this certificate applies to the approved quality administration systems relating to the "Manufacture of Laboratory and Field Testing Equipment".

**40 YEARS OF
BRITISH
INNOVATION** 

Extended Warranties:

All GDS apparatus are covered by a 12 month manufacturers warranty. In addition to the standard warranty, GDS offer comprehensive extended warranties for 12, 24 and 36 months, for peace of mind against any repairs in the future. The extended warranties can be purchased at any time during the first 12 months of ownership.



GDS Training & Installation:

All installations & training are carried out by qualified engineers. A GDS engineer is assigned to each order throughout the sales process. They will quality assure the apparatus prior to shipping, if installation has been purchased, install the apparatus on the customers site & provide the training.



Technical Support:

GDS understand the need for ongoing after sales support, so much so that they have their own dedicated customer support centre. Alongside their support centre GDS use a variety of additional support methods including remote PC support, product helpsheets, video tutorials, email and telephone support.

