



Large Diameter Cyclic Triaxial Testing System (LDCTTS)

Overview: The GDS Large Diameter Cyclic Triaxial Testing System (LDCTTS) is a hydraulically actuated loading frame, with a large diameter triaxial cell suitable for testing samples with large particle sizes such as railway ballast.

The system is capable of both monotonic (static) and dynamic triaxial tests as well as other advanced triaxial tests usually expected from a GDS system.

Key Features:

Flexible system capacity:
Interchangeable (internal submersible) load cells:
GDSDCS (dynamic control system):
Direct closed-loop dynamic control of axial displacement or axial force to 10Hz, sinusoidal, triangular or user defined waveform:

Benefits to the User:

Specimen size, load and pressures can be selected to suit specification and budget.
Load cells to accommodate very soft to very stiff soils with ranges of 8, 16, 25, 32, 64, 128 and 250kN are available. The load frame is supplied with an external load cell to match the model maximum load range of 250kN.
For data acquisition and control, 4 channels of expandable accurate high speed acquisition & control, with up to 500 data points per cycle available.
Accurate and flexible control options with accurate targeting for axial stress during stress path tests.

Upgrade Options

Volume Measurement by HKUST, Bender Element System (Vertical, Horizontal, S and P waves), Hall Effect local Strain, LVDT Local Strain, Unsaturated Testing.

Standards:

AASHTO T-307-99, AS 1289.6.4.1, AS 1289.6.4.2, AS 1289.6.6.1, ASTM D-3999-91, ASTM D-2850-03a, ASTM D-7181, ASTM D-5084, BS 1377-6BS 1377-8, CEN ISO/TS 17892-8, CEN ISO/TS 17892-9, CEN ISO/TS 17892-11JGS 0521, JGS 0522, JGS 0523, JGS 0524, JGS 0541, JGS 0542

Technical Specification:

Load Range (kN):	250
Sample Size (DxH, mm)	300 x 600
Frequency (Hz):	10
Weight Approx (kg):	1280
Frame Dimensions (HxWxD):	3220 x 984 x 902
Powerpack Dimensions (HxWxD):	178 x 155 x 88
Daylight Clearance Max Width (mm):	670
Daylight Clearance Max Height (mm):	1240

System Capabilities

Load Frame

- Direct closed-loop dynamic control of axial displacement or axial force to 10Hz, sinusoidal, triangular or user defined waveform.

Triaxial Cell

- Optional interchangeable (internal submersible) load cells to accommodate very soft to very stiff soils with ranges of 2, 4, 8, 16, 25, 32, 64, 100 are available. The load frame is supplied with an external load cell to match the model maximum load range of 250kN.
- Double acting ram system holds the cell in place on the load frame whilst the lower ram applies forces to the specimen. The top ram allows for correct positioning of the submersible load cell. This means that load frames with base actuators do not have to overcome the weight and momentum of the whole triaxial cell, and the full load frame range may be applied directly to the specimen.
- Up to 300mm diameter x 600mm height test specimen.
- Optional 12 port access ring which, allows simple access for transducers, valves and pipework via its 12 ports.

GDS DCS – Digital Control System

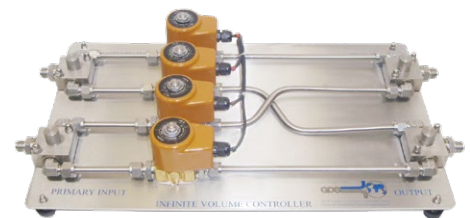
The DCS high speed digital control system has 16 bit data acquisition (A/D) and 16 bit control output (D/A). This means that when running at full capacity the system uses 500 control points per cycle. The multi-axis control system can have up to 3 dynamic actuators being controlled simultaneously and up to 12 high speed data acquisition channels.

Infinite Volume Controller (Optional)

When using a single pressure/volume controller, once the volumetric capacity of the barrel has been reached (either 100% full or 100% empty), the user is required to manually fill or empty the controller accordingly. By connecting two GDS pressure/volume controllers in parallel, the IVC system automatically switches between them when they run out of volume thus providing a seamless supply of pressure with unlimited volume capacity.

Hydraulic Power Unit & Noise Reducing Cover

Pressure for the system is provided by a separate GDS Hydraulic Power Unit which provides a constant source of pressure at 25MPa. This pressure source is used by the axial actuator to control pressure and displacement. It is also used to raise and lower the top beam. The hydraulic power pack is fully piped to include control valves, gauges, pressure and return line microfilters and water cooled heat exchanger. All electrical items are wired to a control box containing motor starters.



Temperature Controlled Testing

GDS have a large range of temperature controlled rock testing systems. Our temperature systems offer two variables; heating & cooling or heating only. Combined heating and cooling systems use coiled tube sections inside the cell; this is connected through the standard ports within the cell base to a temperature control unit allowing temperature transfer close to the specimen.

The cooling system provides ideal conditions for frozen soil testing. Its high pressure testing capability (up to 100MPa) along with low temperature provides the ideal environment for Gas Hydrate Testing. The heating only systems have options from ambient up to either 60°C or 100°C.

Heating Only Options:

- Ambient to 60°C
- Ambient to 100°C

Pressure Options:

- Up to 100MPa

Product Applications:-

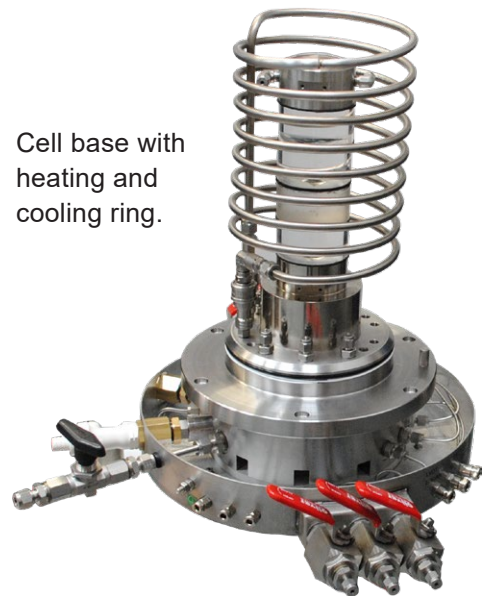
- Frozen Soil Testing
- Gas Hydrate Testing
- High Pressure Testing
- High & Low Temperature Testing

Heating & Cooling Options:

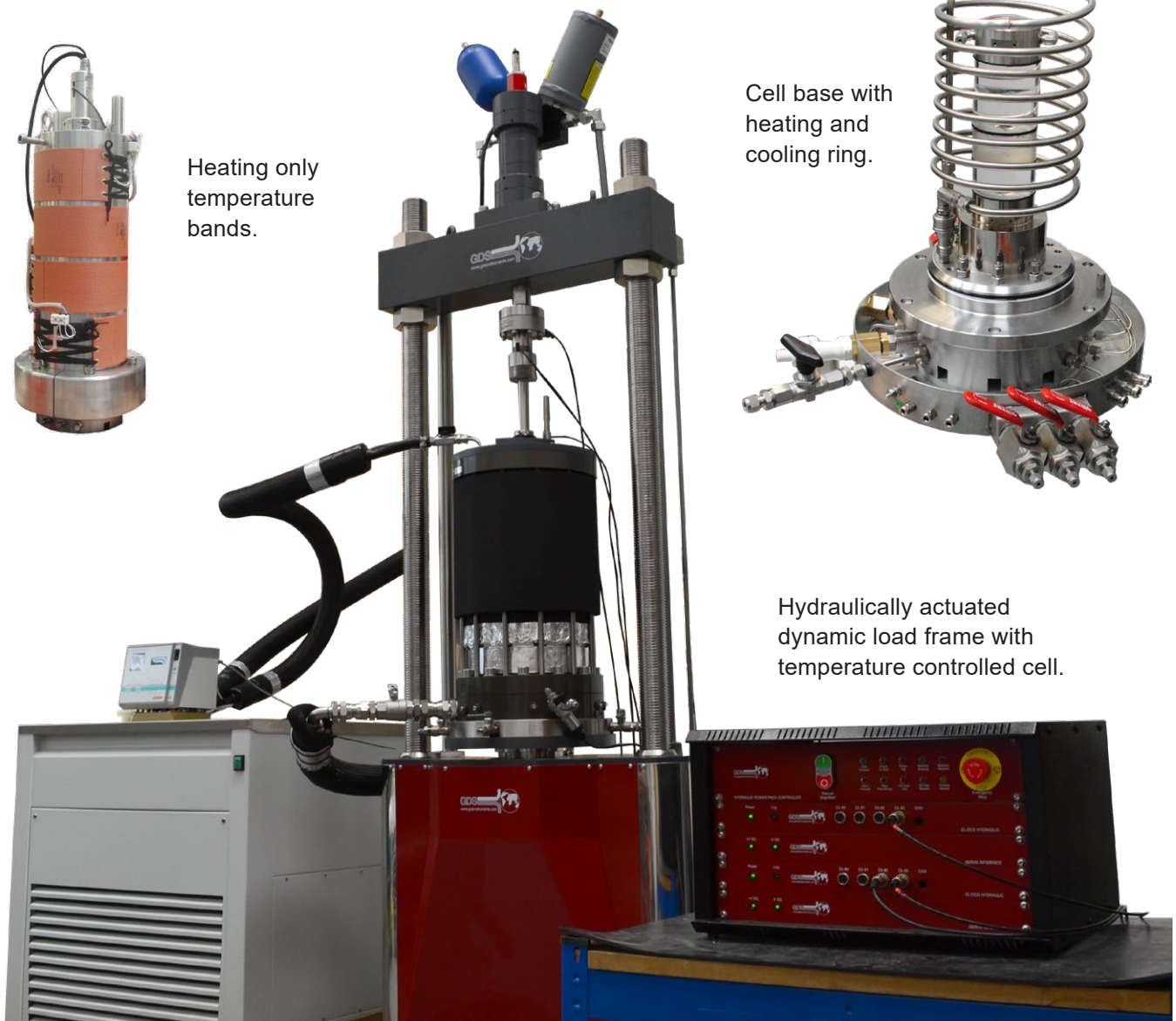
- -30°C to +65°C
- -20°C to +80°C
- -10°C to +65°C



Heating only temperature bands.



Cell base with heating and cooling ring.



Hydraulically actuated dynamic load frame with temperature controlled cell.

GDSLAB Control Software

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.

GDSLAB has the ability to be configured to your hardware of choice, no matter how unique the arrangement. A text file (*.ini) or initialisation file is created that describes the hardware connectivity to the PC. The hardware layout is available in graphical format via the GDSLAB 'object display'. This makes setting up the devices and checking the connectivity extremely simple.

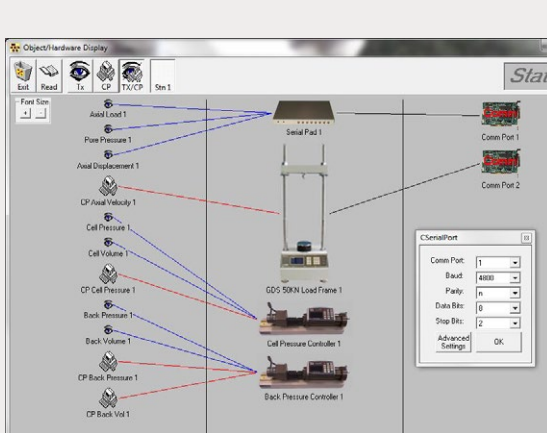


Fig 4. Show a typical set-up screen in GDSLAB

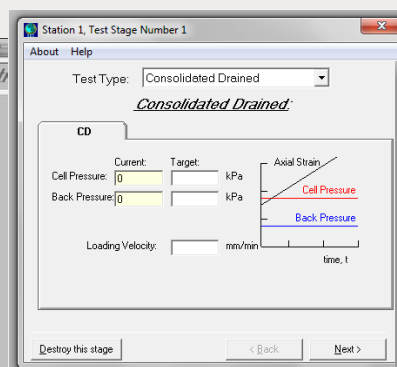


Fig 5. Show a typical station test stage set-up in GDSLAB

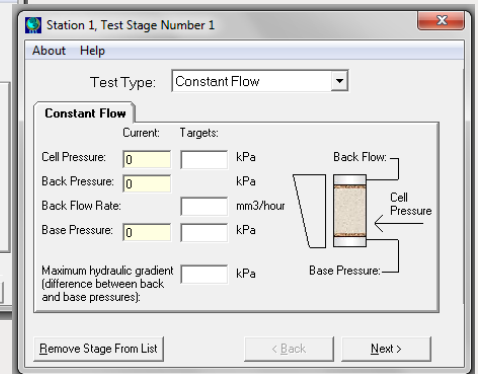


Fig 6. Show a typical station test stage set-up in GDSLAB

Required Operating System: Windows 7 SP1 or higher (We strongly recommend that Windows is fully up to date and running the latest Service Pack/Version available). Recommended PC Specification: 2GHz processor, 4GB Ram, 64Bit Operating System and USB connectivity. Note: GDS software can run on lower spec PC's however; performance and processing of data may be affected.

GDSLAB REPORTS Presentation Software

GDSLAB REPORTS software presents data obtained by GDSLAB to the National Standard, BS 1377:1990. The program can be used to present data whether obtained from a GDSLAB data file or inputted by hand.

GDSLAB Reports can as be used with other manufacturer's dataloggers as well as all versions of GDS data logger. The results can be exported as a CSV file into Microsoft Excel, allowing the user to customise the layout of results.

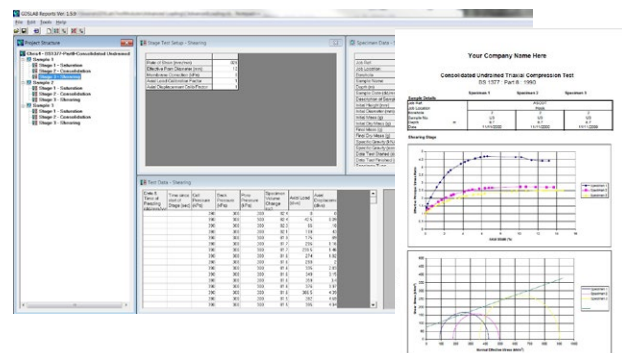


Fig 7. show a selection of screenshots from the GDLAB Reports software.

Acquisition Pad Used for (Dynamic) LDCTTS



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:

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.

