



Hydraulic Loadframes for Soil & Rock (HLF)

Overview: The GDS Hydraulic Loading Frames (HLF) are load frames with a hydraulic dynamic actuator mounted on the cross beam for axial loading. With range of 100kN, and 250kN.

The system is capable of dynamic cyclic axial displacement or axial force and can be synchronised with an optional dynamic cell pressure actuator (radial stress), to give an advanced capability of dynamic stress path testing.

Using large diameter triaxial cells, the HLF enables tests to be performed on large particle sizes such as ballast.

Key Features:

The GDS Hydraulic Axial/Radial Loading Frame can be synchronised with the cell pressure (radial stress):

Advanced transducers available:

GDS load frames are extremely stiff and are designed to allow minimum backlash at the point of sample shearing:

The system is capable of both monotonic (static) and dynamic triaxial tests:

Dynamic control of axial displacement or axial force up to 20Hz (frame dependant), sinusoidal waveform:

Benefits to the User:

To give a wider range of testing options for the user, the system can provide stable radial stress during testing, removing the requirement for a balanced ram system, with the ability to add an additional dynamic pressure controller to cycle the back/pore pressure during testing.

A number of optional advanced transducers can be added to the standard system to give measurement of local axial strain and mid-plane pore pressures. Cells can also be updated to incorporate acoustic velocity and acoustic emission transducers.

Other, less stiff load frames can have adverse effects on the results at the point of specimen failure. At this critical point in the test, due to the compliance in the system under high load, the resulting backlash that is released after failure can affect the results of the test. GDS has overcome this by ensuring the frames are designed to be stiff and rigid at their maximum loads.

As well as other advanced triaxial tests usually expected from a GDS system, the system is able to perform static testing, allowing for a single system to perform a wider range of tests.

Direct (dynamic, up to 20Hz frame dependant) closed loop control of axial displacement, axial force and cell pressure.

HLF100 Technical Specification:

Load Range:	100kN
Pressure Range:	2, 4, 20MPa
Sample Size:	70, 100, 150mm

Optional Extras:

Heating Only	Ambient to 60°C
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HLF250 Technical Specification:

Load Range:	250kN
Pressure Range:	1MPa
Sample Size:	300mm
Lifting Arrangement	Included

Optional Extras:

Sample Table Assembly	Available
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Load Frame Options:

Load Frames and Dimensions



100kN Loadframe

	100kN	250kN
Height (mm):	2500	3220
Width (mm):	790	984
Depth (mm):	902	902
Daylight clearance for test cell:		
Max width (mm):	500	600
Max height (mm):	900	1150
Weight (kg):	670	1280

Triaxial Cells

Cells Available:	Pressure (MPa):	Max Specimen Height/Diameter (mm)	Balanced Ram:
High Pressure Cells:	4	200 / 100	N
	10	300 / 150	N
	14	200 / 100	N
	20	200 / 100	N
	32	108 / 54	N
	64	200 / 100	Y
	70	140 / 70	N
	100	100 / 50	N
Instrumented Hoek Cell:	70	101.6 / 50.8	N
Large Diameter	1	≤ 300	N

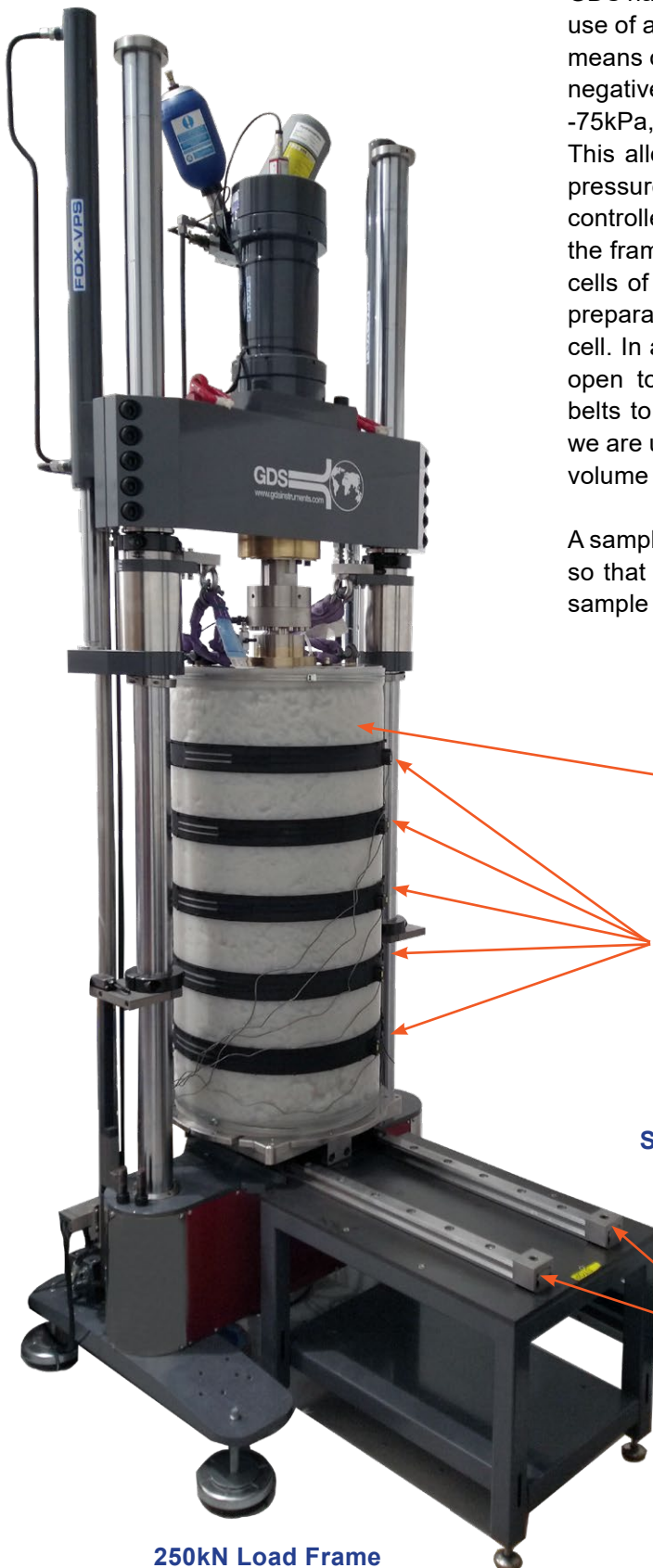
Pressure Volume / Controller

Controllers Available:	Pressure (MPa):
Advanced Pressure Volume Controller:	up to 4
High Pressure Advanced Volume Controllers:	8, 16, 32, 64, 100
Cell and Back Pressure Intensifier:	4MPa / 1000cc

Vacuum Controlled Specimen Option

GDS have a unique system for testing large samples without the use of a triaxial cell. Effective stress is applied to the sample by means of a GDS vacuum controller, which can accurately apply negative pressure between atmospheric pressure (0kPa) and -75kPa, depending on the source vacuum pump being used. This allows the sample to be consolidated with negative pore pressure and confining pressure at atmospheric. The vacuum controlled technique allows a larger size of sample to be used in the frame than would be possible if using a triaxial cell. Triaxial cells of this size are bulky and also costly items, with sample preparation time significantly reduced without the need for a cell. In addition to the simplicity and speed, having the sample open to atmosphere allows for multiple radial displacement belts to be easily installed and adjusted. In the example here we are using 5 belts which allows for good approximation of the volume of the sample throughout the test.

A sample preparation table is provided running on linear guides so that the sample can be slid out of the load frame for easy sample preparation and removal.



Membrane: 4mm thick membrane.

Radial Belts: Radial belts around the specimen with draw wire transducers to measure the circumferential deformation. Standard options 100mm and 200mm range, additional ranges available on request.

Specimen Size: 500mm diameter x 1000mm height.

Linear Guides: Sample preparation table with linear guides allow for easy sample preparation and removal.

250kN Load Frame

Temperature Controlled Testing Options

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, 100°C or 150°C.

Heating Only Options:

- Ambient to 60°C
- Ambient to 100°C
- Ambient to 150°C

Product Applications:-

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

Heating & Cooling Options:

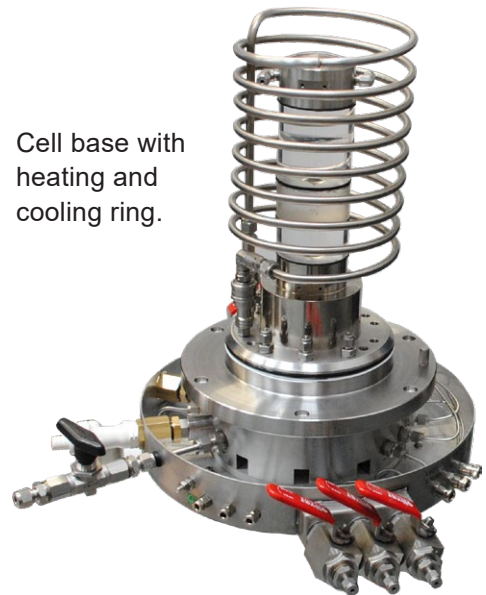
- -30°C to +85°C
- -20°C to +85°C
- -10°C to +60°C

Pressure Options:

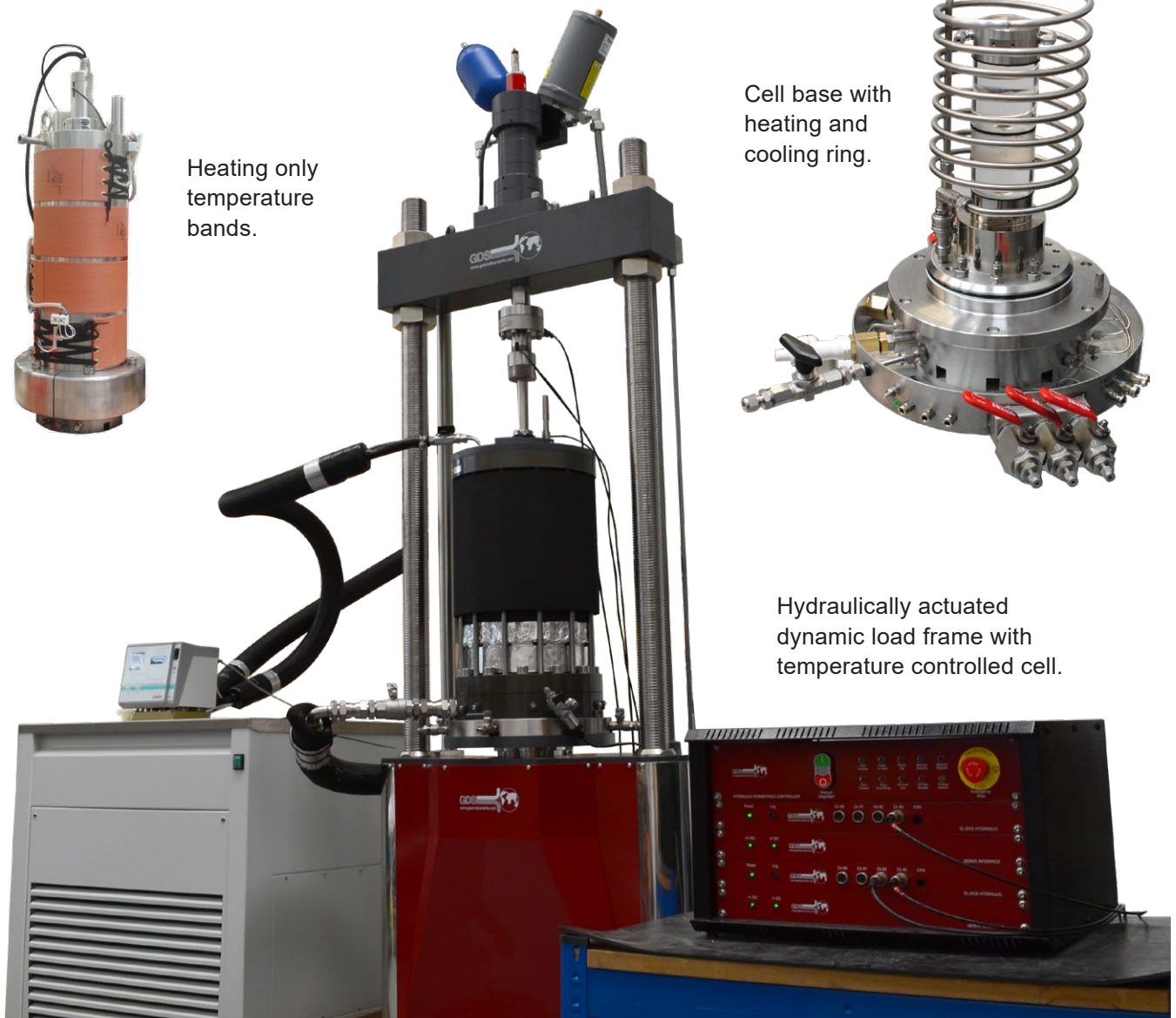
- 4, 10, 14, 20, 32, 64, 70 or 100MPa



Heating only temperature bands.

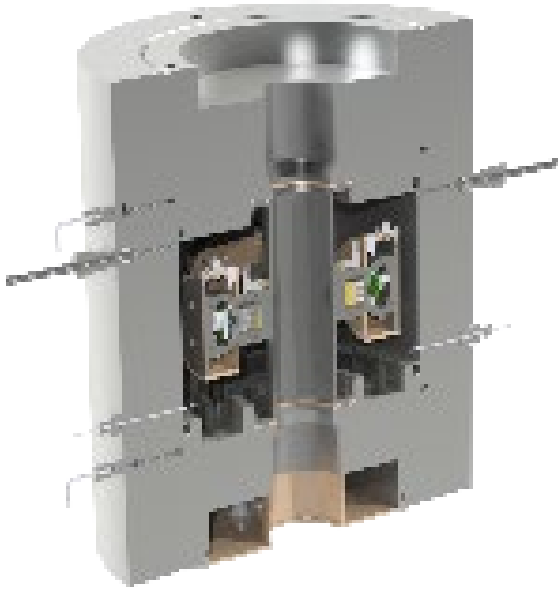


Cell base with heating and cooling ring.



Hydraulically actuated dynamic load frame with temperature controlled cell.

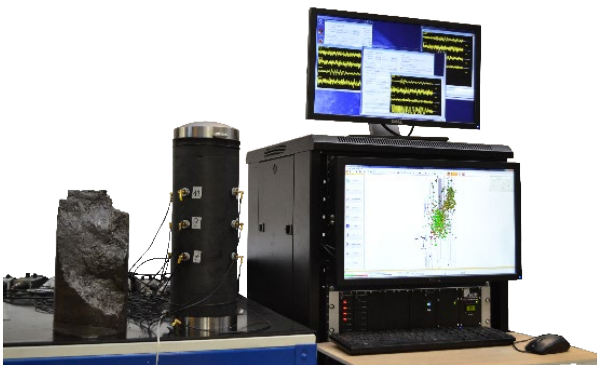
Instrumented Hoek Cell (Optional):



The GDS Instrumented Hoek Cell brings together the traditional high pressure Hoek Cell, with the functionality of advanced testing capabilities for Acoustic Emission (AE) and Acoustic Velocity (AV) testing. Below are some features and benefits of the cell.

- Max pressure: 70MPa.
- Upgrades available: Acoustic Emission & Acoustic Velocity (both horizontal (up to two sets) and vertical).
- Sizes available: 38.1mm and 50.8mm diameter.
- Special membranes allow for the AE and AV transducers to quick connect via push fit connections.
- AV transducers are mounted in the topcap and pedestal.
- Up to 12 AE transducers, 1 set of vertical AV transducer, up to 2 sets of horizontal AV transducers can be installed in each cell.
- Access to the inner chamber and membrane is done with a screw threaded top section and a specially designed top plate that allows the entire internals of the cell to be removed for easy maintenance.

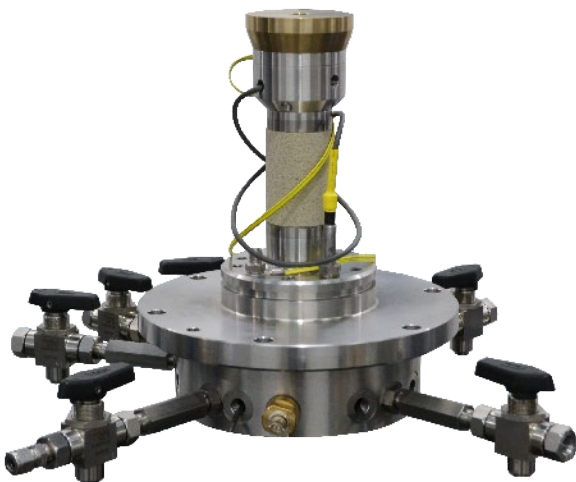
Acoustic Emission Transducers (Optional):



The AE transducers enable micro-fractures occurring within a rock specimen during testing to be recorded and analysed. Analysis of rock micro fractures can give information as to the failure mechanisms of a sample under test as well as determining the onset of failure.

The AE system may be specified as a triggered type system or a continuous acquisition system. The triggered 'hit counter' system yields less but more simple data to process, whereas, the continuous system never misses a beat. The system can be configured to use both triggered and continuous data acquisition.

Acoustic Velocity Transducers (Optional):



Systems to measure the P- and S- Wave velocity within a sample. AV sensors are generally used where pressures and load exceed those where bender elements can be used. AV sensors are based on the same principle as bender elements but the piezo ceramic elements are not exposed to the environment so they can be used at pressures up to 100MPa and an axial force up to 2MN. Sensors are mounted in the pedestal and topcap or to the sides of the sample in some cases. Each sensor package contains a Compressional wave (P-Wave) element and two shear wave (S-Wave) elements.

The Shear wave elements are set in orthogonal directions to allow two shear waves to be generated with different polarisation, which, is important where samples may be cross-anisotropic or fully anisotropic.

Typical System Setup Using a Dynamic Servo-hydraulic Load frame

ELDCS Acquisition Pad

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.

Transducers:

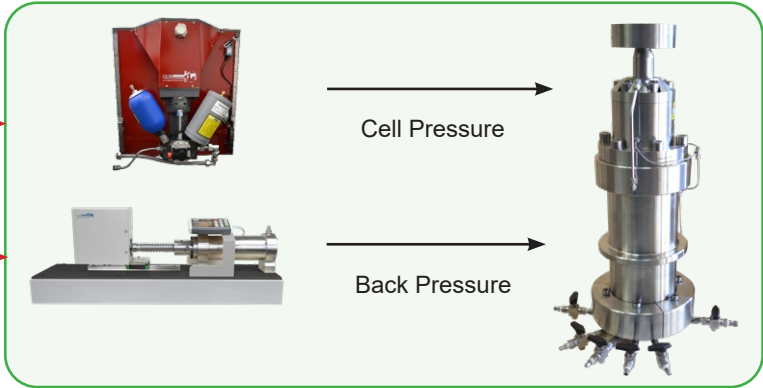
- Load cell: External load cell (removable and can be replaced by other ranges 5, 10, 16, 32, 64, 128, 250, 400 or 500kN are all optionally available) Load cell accuracy: Better than 0.25% FRO
- Total Axial Displacement: 100mm. Pore Pressure Transducer: up to 100MPa static, 70MPa dynamic
- Temperature control sensor: 0-100°C

GDSLAB Software:

The GDSLAB control and acquisition software is a highly developed and extremely flexible software platform. Starting with the Kernel module and the ability to perform data acquisition only, additional modules may be chosen for your testing requirements.

Hydraulic Powerpack:

- Flow-rate range between 20 - 70 litres per minute
- 3 phase power required
- Dimensions (HxWxL) 1800 x 1000 x 1550mm



Note: Connection via USB interface to PC.

Triaxial Cells & Pressure Control System:

Cell Pressure ranges: 1MPa up to 100MPa

- From 25mm up to 100mm (high pressure >1MPa)
- Up to 500mm (low pressure <1MPa)

Controllers:

- Enterprise (1MPa),
- Standard (up to 4MPa),
- Advanced (low pressure, up to 4MPa.)
- High Pressure up to 100MPa

Load Frame

- 100kN, 250kN or 1500kN, dynamic servo hydraulic controlled frame
- Actuator control frequency up to 20Hz

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.

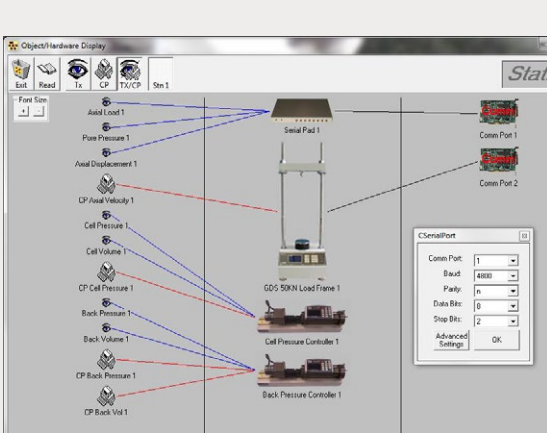


Fig 4. Show a typical set-up screen in GDSLAB

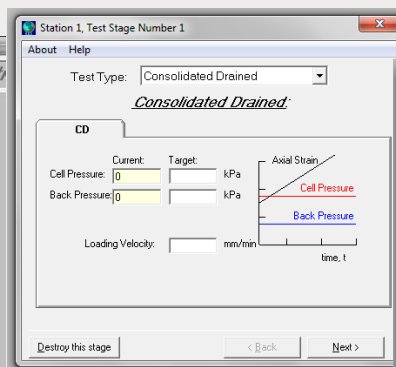


Fig 5. Show a typical station test stage set-up in GDSLAB

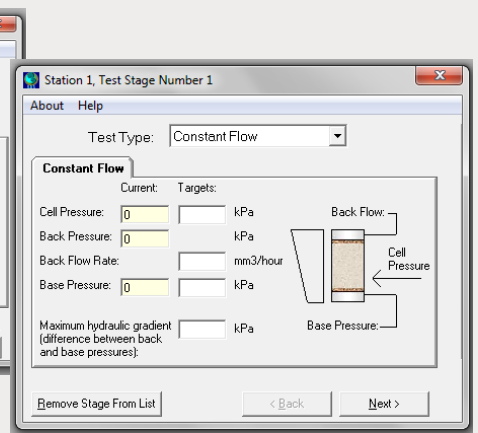


Fig 6. Show a typical station test stage set-up in GDSLAB

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.

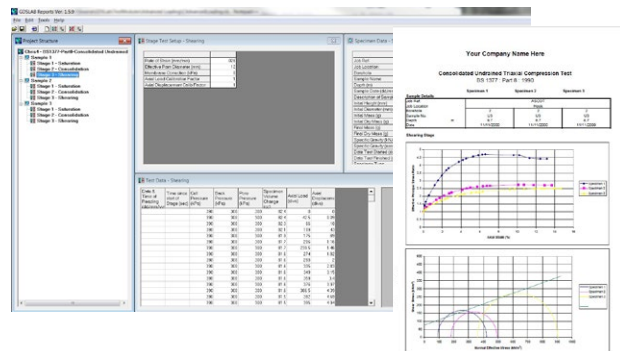


Fig 7. show a selection of screenshots from the GDLAB Reports software.

ELDCS Acquisition Pad Used for HLF's



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.

