

20 MPA
pressure cell
in loadframe

Constant Rate of Strain Cell (CRS)

The GDS Constant Rate of Strain Cell (CRS) is a load frame based one dimensional consolidation cell capable of applying back pressure and measuring pore pressures from 1MPa (low pressure version), 3MPa (medium pressure version), to 20MPa (high pressure version).

Coupled with GDS Controllers and software, the system will run the entire test from start to finish through a loading path specified by the user, using constant rate of strain loading.

Key Features:

Benefits to the User:

Stress control:	As well as constant rate of strain, stress may be applied on a constant (creep tests) or incremental basis identical to a traditional oedometer.
Constant rate of strain with controlled back pressure:	Drainage is through the base of the apparatus meaning excess pore pressure can be monitored and controlled. Tests can run whilst maintaining a specified maximum excess pore pressure, therefore increasing specimen throughput due to faster testing times.
Program the entire test from start to finish with multiple test stages:	More efficient testing as no waiting for user inputs.
Interchangeable range submersible loadcell:	Enables the user to run tests on soils of significantly different stiffness, and match the load transducers accordingly, giving greater accuracy of results, plus seal friction does not effect load readings.
Construction material:	1MPa: Anodised aluminium with perspex outer cell wall. 3MPa: Aluminium. 20MPa: Stainless steel.
Integral cutter/sample ring:	Disturbance on samples is reduced by having a cutting edge integrated into the sample confinement ring.

Tests that can be Performed:

Constant rate of Loading (CRL) Consolidation, Constant rate of strain (CRS) Consolidation, Consolidation Testing, K0 (K-Zero), Multi-stage Testing, Oedometer/Consolidation, Constant Head Permeability, Pore Water Volume Change, Quasi-Static (low speed/creep) Tests, RAMP and CYCLE pressure or volume change (Saturation Ramp), Axial Compression, Load Control (Static), Static Displacement, Static Load, Stepped Loading.

Upgrade Options:

Unsaturated testing, Bender Element testing, Temperature control and Permeability testing.

Technical Specification:

Load Range (kN):	10, 50 (Requires LF50)
Pressure Range (MPa):	1, 3, 20
Sample Sizes (mm):	50, 63.5, 70, 75, 100 x 22

How does it work?

Instead of applying stress increments in stages as in a typical oedometer consolidation test, the load can be gradually applied to the sample by increasing the axial strain at a constant rate. Controlled back pressure (water) is applied to the sample and drainage is allowed through the base of the apparatus. The advantage of this method is that the time required to complete a consolidation test can be reduced significantly by maintaining close control of the excess pore pressures generated.

System Elements

A GDS pressure controller is used to apply the back pressure. A standard load frame controls the vertical stress and strain, with strain rates typically up to 100mm/min. A force transducer placed at the end of a piston measures the force, and pore pressure is measured by a transducer connected to the base filter stone. The sample itself is confined between two porous plates in a steel ring, which prevents horizontal deformation and reduces friction. The low/medium pressure cells (see Fig.1 below) are designed to be used with an internal submersible load cell, whereas the high pressure version (see Fig.2 below) is used with an external load cell only. GDS also have the option for an open-topped CRS cell see Fig 3. This is like a traditional oedometer cell but has a sealed lower porous disc allowing pore pressure measurements to be taken at the base of the specimen.



Fig 1. Low pressure cell (1MPa)



Fig 2. High pressure cell (20MPa)

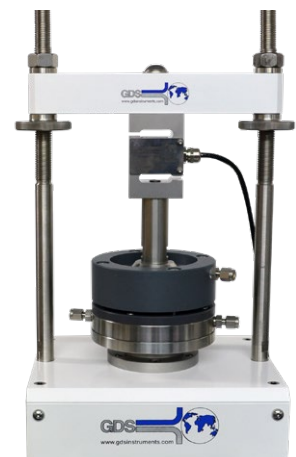


Fig 3. Open-topped CRS

Temperature Control:

GDS' Constant Rate of Strain cell is available with temperature control. It is available with heating from ambient to 65°C or ambient to 100°C. This cell is high pressure (up to 20MPa) and can accommodate sample sizes up to 50mm.

The load frame actuated cell can fit a number of different load frames. Other temperature ranges including heating and cooling are available upon request.



USB 8 Channel Logger Used in GDSCRS*

Overview: The USB 8 channel logger is a 24 bit digital acquisition system developed specifically for use with transducers likely to be used in a geotechnical laboratory.



The device provides eight fully independent channels of simultaneously sampled ultra-high resolution 24-bit data. Each channel has 22 software selectable gain ranges, precision ratiometric transducer excitation, and industry standard DIN connection allows the full-range of GDS transducers to be quickly and easily connected and configured.

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. With the ability to connect multiple USB Pads per PC it is possible to build, expand and customise data acquisition systems by using multiple devices to suit requirements.

*When a DigiRFM is used the logger is no longer required.

Technical Specification:

Connection to PC:	USB
Acquisition Channels:	8
Multi Box Capability:	x10
Max Number of Channels:	Up to 80
Sample Rate:	500Hz*
Resolution:	24 Bit: 16,777,216
Gain Ranges:	22 (User defined in software)
Description:	For use on all static systems where logging is usually 1 point every 2 seconds or slower. *Can be configured to acquire data up to 500Hz only in certain hardware configurations.
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:	22 Independently Selectable Ranges Per Channel from (-22...+22mV) to (-11.63...+11.63V)
Excitation Current Sense:	Yes - can monitor transducer currents - alerts user of disconnected transducers
Excitation/Transducer Fault Detection:	Overvoltage, Overcurrent, Absent Transducer
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:	-22...+22mV to -11.63...+11.63V for balanced differential signals
Transducer Calibration:	Linear
Data Acquisition Options:	Digital filtering for noise reduction
Sample Docking:	Manual
Display and Monitoring:	Data acquisition in GDSLab via USB interface, High resolution real time graphs
Software:	GDSLAB
System Characteristics:	200 MHz dual core ARM Cortex-M4 CPU, 32-bit architecture, On-board flash memory, 480 Mbit/s USB connection
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.

