World leaders in the manufacture of laboratory systems for soil & rock

Continuous Surface Wave System (CSWS)

Overview: GDS produce 2 types of surface wave system. Each system works on the same fundamental principal, that Rayleigh waves (surface waves) can be generated at a source and the measured on the ground using geophones. The difference between the systems are that the CSWS system uses a ground vibrator as the source of the energy, and the SASW uses an impact source (usually a sledge hammer).

The CSWS can be specifically set to vibrate at frequencies as low as 5Hz, with a resolution of 0.1Hz. With significantly lower frequencies being generated, the CSWS system typically measures to penetration depths between 2 and 3 times that of the SASW system.

Key Features: Benefits to the User:

| Provides depth profile up to 30m: | Provides on-line shear modulus with depth profile to depths of up to 30m depending on the type of soil or rock |
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| Rapid results through non-invasive test methods: | Enables rapid assessment of ground variability across a site in terms of stiffness via a non-invasive test. |
| In-situ nondestructive testing: | Provides stiffness parameters for ground that is difficult or impossible to sample in a representative manner, e.g. granular soils and highly fractured rock. |
| Quick test: | Verifies soil improvement, from dynamic compaction, vibrofloationation and classic consolidation. |
| Enables the measurement of Gmax: | Enables the measurement of Gmax which can provide a valuable benchmark for stiffness investigations in soils and sample quality. |
| Automated test software: | The user enters the required test frequencies and the software runs the complete test automatically. Output can be imported directly into Microsoft® Excel. Data output includes time domain, frequency domain (magnitude and phase), coherence and stiffness v depth using the Lambda/3 method. |
| Lightweight & portable design: | Rugged, robust, smaller and lighter control unit (version III control unit weighs only 5.5kg) and is supplied with a padded transport case with built in laptop weather hood. |

Tests that can be Performed:
Non invasive shear wave velocity and shear modulus testing.

Upgrade Options:
Standard system for 2-6 geophones, upgradeable to a maximum of 12. Can be used as a Spectral Analysis of Surface Waves (SASW) test system using an impact source.

Technical Specification:

| Computer Interface: | USB Connection |
| Data Aquisition: | 16 Bit |
| Dimensions (mm): | Unit: 400 x 380 x 150 Ground Vibrator: 450 x 350 x 180 |
| Power: | 12-24V DC |
| Weight Approx (kg): | Ground Vibrator: 70, Control Unit: 5.5 |
System set-up

The system set-up is shown below. A computer-controlled inertial vibrator applies a precisely regulated and measured continuous vertically polarized disturbance to the ground surface. This generates surface waves which are detected by a line of sensors (geophones) which are co-linear with the vibrator. The signals from the sensors are fed back to the computer which analyses the phase relationships between them and so computes the velocity of the surface wave. By changing the frequency of the continuous wave generated by the vibrator, velocity measurements can be made over a range of depths. The measured dispersion curve is inverted to produce a profile of surface wave velocity with depth. By entering the bulk density and its Poisson’s ratio of the soil/rock, this profile is converted to that of shear modulus with depth. These parameters may be estimated on site with minimal errors in stiffness.

The CSWS uses a frequency controlled vibrator to regulate the frequency of these surface waves, thus permitting a dispersion curve (velocity against frequency or wavelength) to be readily determined. By using the theory of elasticity, shear wave velocity and shear modulus G can be determined from these velocity measurements.

The plot of shear stiffness against depth may be viewed after each stiffness measurement is made. Typically a shear stiffness-depth profile will contain between 50 and 100 separate stiffness measurements at different depths. By using smaller frequency increments, even more stiffness measurements may be made. A typical profile will take about 45 minutes to produce. If the cost of each individual stiffness measurement is considered, the surface wave system works out cheaper than other direct methods of measurement such as the pressuremeter and the plate loading test.
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CSWS Continuous Surface Wave System Software

Written for use with the GDS Continuous Surface Wave System. The user enters a range of frequencies for the test, and the software will precisely regulate the inertial vibrator at each specified frequency, while automatically producing a dispersion curve by performing a Fast Fourier Transform on the data at each frequency. Time domain and frequency data may be saved.

Screenshots of the CSWS software.
Why Buy GDS?

GDS have supplied equipment to over 75% of the world’s top 50 Universities:

GDS have supplied equipment to over 75% of the world’s top 50 Universities who specialise in Civil & Structural Engineering, according to the “QS World University Ranking 2017” report.

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

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”.

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.