Acoustic Emission Transducers (GDSAE)

The Acoustic Emission 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 tests well as determining the onset of failure.

The GDSAE system can be configured either as a simple Hit Counter type system or a full fracture location / velocity tomography system. The GDSAE system may be specified as a triggered type system or a continuous acquisition system. The triggered 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 types of data acquisition.

### Key Features:

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<th>High speed data acquisition systems:</th>
<th>Benefits to the User:</th>
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<tr>
<td>Continuous System: 10MHz:</td>
<td>High Speed data acquisition yields high resolution measurement in the time domain.</td>
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<td>Triggered System: 50MHz</td>
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<td>High resolution with 12-or 16 Bit:</td>
<td>High Bit counts allow for high resolution measurement in terms of amplitude.</td>
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<td>Synchronous data acquisition:</td>
<td>Truly synchronous data acquisition means that the recorded data does not need to be corrected for time shift across each channel during the acquisition process. This makes for simpler processing of data.</td>
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<td>Varied systems range:</td>
<td>Systems range from simple counter systems through to complete systems that can locate the origin of the event within the sample.</td>
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<td>Submersible Transducers:</td>
<td>Acoustic Emission sensors have been tested at pressures up to 64MPa and are designed to withstand 100MPa. The sensors are for use in non-conducting media only.</td>
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<td>Compact design:</td>
<td>Allows the sensors to be fitted to most systems.</td>
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<td>Lightweight:</td>
<td>Titanium construction means the sensors are sufficiently light enough, that they can be supported by the membrane alone with no need for a support structure.</td>
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<td>Easyfit design:</td>
<td>Using GDS push in, self-sealing grommets, sensors can be fitted to standard membranes by simply cutting a small hole in the membrane.</td>
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<td>Coaxial High pressure feed throughs:</td>
<td>50 Ohm high pressure (64MPa) feed throughs in either single or triple channel configurations.</td>
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### Upgrade Options:

- Triggered data acquisition system.
- Continuous data acquisition system.
- Continuous and triggered data acquisition system.
- Optional velocity tomographic surveys to “map” the acoustic velocity variations within a sample.

### Technical Specification:

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<th>Pressure Range (MPa):</th>
<th>100 in non-conducting fluid</th>
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<tr>
<td>Specimen Diameters (mm):</td>
<td>Fits all sample sizes</td>
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<tr>
<td>Weight:</td>
<td>0.01 kg</td>
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Triggered & Continuous Systems

There are two different data acquisition types available for the GDS acoustic emission system, continuous and triggered. The triggered system is armed and waits for an acoustic emission before starting to acquire data, it then acquires data for a predetermined time before stopping and waiting for the next trigger signal or event. The continuous system commences data acquisition when started and then runs until stopped.

The advantage of the triggered system is that the volume of acquired data is massively reduced, this may however result in some missed events. The continuous system misses nothing.

After a test, the data needs to be leached, this is the process of sifting through the data to look for events. This is done automatically by pre-setting the properties of the events that are to be analysed. These properties include, but are not limited to, amplitude, frequency and the number of sensors that "see" the event.

This is where the main advantage of the continuous system becomes apparent, in that if the trigger properties do not yield sufficient data or are set erroneously, the leaching process can be repeated with different parameters, because all the data available is acquired. Were the trigger settings not correct for the triggered system the whole test would have to be physically repeated.

Triggered System:

As the data acquisition systems are only triggered when an event occurs and for a limited duration, the data acquisition speeds can be faster than for continuous systems. Due to this the triggered system becomes the right choice when studies are being made on either very stiff samples (and so very high propagation speeds) or smaller samples where the acquisition rate needs to be faster to maintain resolution on the arrival times at the sensors.

Triggering can be set to all sensors and to occur across multiple sensors within a given time window, to ensure that less spurious signals are triggers for the data acquisition systems.

Continuous System:

The continuous system uses the catch-all approach, in that the acquisition is running from the moment the start button is pressed until it is stopped. The harvesting of continuous data allows the user to reprocess data in many different ways to ensure that nothing is missed. Data can be digitally filtered, threshold triggered along with many other processing options with the supplied software.

Please note: The volumes of data produced by the continuous system are very large so the system is supplied with a minimum of 6Tb for a 12 channel system with another 2Tb in the building server grade processing PC.
Transducers:

- Fig 3. Transducer fixed on to a specimen, using GDS' self-sealing grommets.
- Fig 4. Unmounted Transducer
- Fig 5. Detailed technical drawing of transducer

Software:

- Data Acquisition & Control.
- Data leeching (to extract Acoustic Emission instances from continuous data).
- Picking & Auto Picking.
- Acoustic Emission event locating.
- 3D modelling of event locations.
- Set-up and execute for velocity surveys.

Fig 6. Shows 3D Modelling of event locations
Fig 7. Time domain traces with auto picking

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Technical Support:

GDS provide comprehensive on-site product training and installation. GDS understand the need for ongoing after sales support, so much so that they have their own dedicated customer support centre. The support centre allows the user to log queries, download helpsheets and get the latest information on product updates. The site is fully searchable and provides a great resource to customers.

Alongside their support centre GDS use a variety of additional support methods including...

- **Remote PC Support**: Remote PC support works by GDS providing a secure link to a customers PC, thereby allowing GDS to take control. Once in control of the PC, GDS can help with any problems associated to software, installation, testing etc.
- **Product Helpsheets**: The helpsheets are the GDS FAQ documents. They cover a multitude of hardware and software questions and are free to download from our online support centre.
- **YouTube Channel**: GDS YouTube channel holds both software and hardware video's aimed to give you better understanding of how the products work.
- **Email & Telephone Support**: If you prefer you can email requests to support@gdsinstruments.com where they will be automatically added to the support system and then allocated to a support engineer.

GDS online customer support centre.

GDS Awarded Queens Award for Enterprise in International Trade:

GDS have been presented with the most prestigious corporate award made in the UK – The Queen's Award for Enterprise in the International Trade category. GDS are delighted to have won the award which has been given to GDS for increasing overseas trade by 190% over six years of continuous sustained growth, and for selling over 85% of their production overseas. GDS have achieved this through a combination of continuous product development, understanding customer’s requirements and a company wide dedication to customer support.

Why Buy GDS?

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Made in the UK:

All GDS products are designed, manufactured and assembled in the UK at our offices in Hook. Quality assurance is taken of all products before they are dispatched.

GDS are an ISO9001:2000 accredited company. The scope of this certificate applies to the approved quality administration systems relating to the “Manufacture of Laboratory and Field Testing Equipment”.

Due to continued development, specifications may change without notice. See the GDS website for the full product range & to visit our Geotechnical Learning Zone.