

The HORSA produces the following waves from a lined or unlined borehole:

- Vertically polarised, horizontally propagating shear waves, S_{VH}

- Horizontally polarised, horizontally propagating shear waves, S_{HH}

using only a 12V battery power source.

The HORSA system can be used in a 100mm borehole for cross-hole, cross-hole tomography and up-hole testing.

Horizontally Polarised Shear Wave Actuator (HORSA)



What is it?

The Horizontal Shear Wave Actuator (HORSA) is a versatile exploration tool for down-hole commercial and research cross-hole testing. Encompassing both a vertically (S_{VH}) and horizontally (S_{HH}) polarised shear-wave source, the HORSA probe is unique as it enables a full investigation of the nature of the subsurface. It has applications in civil engineering, mining and the determination of seismicity.

To date, most cross-hole surveys have utilised vertically polarised shear waves (S_v) or compression waves (P). As the numerical modeling techniques available to geotechnical engineers become increasingly sophisticated, more detailed knowledge of different elastic parameters for design purposes is required. The HORSA provides this information which is not readily available otherwise.

The generation of horizontally polarised shear waves down a small borehole (<5" or 100mm) has presented many problems in the past. For this reason, GDS Instruments Ltd has joined a consortium to develop this rugged and reliable tool for the determination of basic dynamic elastic moduli through to cross-anisotropy elastic moduli.

Trace Z X Y

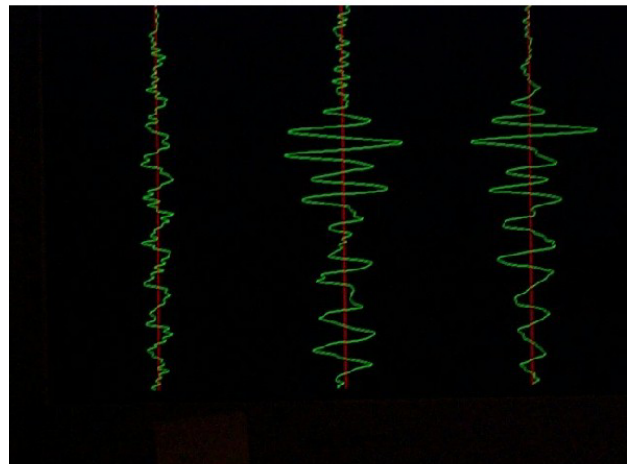


Fig. 1 Example of time domain output with HORSA: trace Z = vertical, trace X = horizontal 1 and trace Y = horizontal 2

Technical specification

- Power: 24V DC
- Actuator type: pneumatic single S_{VH} , double opposing S_{HH} .
- Interchangeable S_v or S_H transmitter
- For use in lined/unlined boreholes
- May be employed in horizontal or vertical boreholes
- Pneumatic clamps adjustable for soft formations
- Consistent signal amplitude
- 100m operational depth
- Detachable from control cable for transportation
- Stainless steel construction

NB A complete cross-hole system requires: a HORSA plus power source, 1 or 2 borehole picks (geophones) and 1 GDS seismic control unit or existing seismograph.

Control unit

Size: 290 (W) x 180 (D) x 160 (H)mm
 Weight: 2.0kg
 Power: 24V DC
 Recycling period: 5secs

The HORSA unit operates from a battery power supply and enables surveys to be undertaken in remote locations afforded by its small size and light weight. Surveys may be undertaken within boreholes to 100m.



Sonde (down-hole source)

Operation: S_V and S_H bi-directional source
 Diameter: 70mm
 Length: 1100mm
 Clamp: 4 pneumatic pistons located at upper end of sonde
 Frequency: $S_V = 470\text{Hz}$, $S_H = 600\text{Hz}$
 Weight: 10.0kg

The variable clamp pressure ensures the most suitable clamping force for a variety of sedimentary and hard rock formations without undue deformation of the formation.



Cable

Diameter: 14mm
 Length: 100m

Composite pneumatic/electrical cable moulded onto a single waterproof connector. The HORSA unit may also be supplied as a stand-alone unit without the vertically polarised S_V source. The unit operates from a similarly sized control unit from a 24V DC battery power supply.

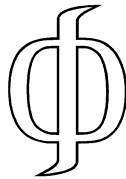
Why buy GDS HORSA?

- Small diameter for 100mm borehole
- Pneumatic not hydraulic operation – no hydraulic fluid necessary and hence easy transportation
- Battery powered – 12V DC
- Rapid exchange of the source component – 6 screws and two pneumatic pipes
- Built in trigger sensor additional trigger phone not required. Compatible with most seismographs
- Small control unit with built-in compressor

Development partners



University of Newcastle



Soil Mechanics



Sensor and Sensor Systems for Industrial Applications (S3IA)



Department of Trade and Industry's LINK programme



Due to continued development, specifications may change without notice.