

- **3-component tri-axial sensors**
- **Motor-driven clamp mechanism**
- **Fits in 2-inch (51-mm) boreholes**
- **Automatic orientation of horizontal geophones to any azimuth (Model BHG-3)**
- **Cable disconnects for convenient surface handling and extending depth**
- **Works in wet or dry holes**

Geostuff's BHG series, 3-component borehole geophones are designed for shallow seismic velocity measurements. Both units include a motor-driven clamp to hold the sensor in position in the borehole.

These geophones are applicable to a wide variety of shallow surveys, including shothole logging, downhole shear wave measurements, static corrections for petroleum shear-wave reflection surveys, cross-hole, tomographic, seam wave, and shallow VSP surveys for coal, minerals, and rock mechanics.

Model BHG-3 includes a fluxgate compass and servo mechanism which automatically orients the horizontal geophones to any magnetic azimuth selected by the operator. Thus, the longitudinal sensor can be aligned with the polarization of the shear wave source.

While downhole shear wave surveys have traditionally been done with random orientation, being able to precisely align one of the horizontal geophones with the plank or energy source provides significant advantages. Anisotropy appears to be much more common than originally thought, and the velocities of horizontally polarized shear waves vary with azimuth. With an orientable geophone, these velocity variations may be measured or simply avoided. By maintaining orientation of the source-receiver combination all the way down the borehole, the user can maintain better control and recognition of shear wave arrivals.

The clamping mechanism is a steel leaf spring, compressed by a motor-driven piston. When compressed, the spring expands, forcing the geophone against the borehole wall.

The tool may be used in soft-wall, uncased holes as well as cased holes. In the unlikely event of a failure to release, the tool may be dragged up the hole against the spring friction. The motor-driven spring is faster, more reliable, and less cumbersome than the common alternative using an inflated bladder.



Download a free copy of
our tutorial paper
“**Borehole Shear-Wave
Surveys for Engineering
Site Investigations**” at
<http://www.geostuff.com>



Controllers:

The controller directs the voltages to control the clamping mechanism and servo mechanism. A meter monitors motor current to indicate the clamping action and force. The BHGC-1B operates a single downhole geophone. The BHGC-4 can operate up to four geophones. These units are usable with either the BHG-2 or the BHG-3.

A rechargeable, internal, 24-volt battery is supplied, along with a 110/220 volt charger.



Common Specifications

Number of geophones: 1 vertical and 2 horizontal in an X-Y-Z configuration

Natural Frequency: 15-Hz high-output omnidirectional is standard; 10, 28 and 40 Hz optional

Pressure rating: 300 meters (1000 ft) water depth, consult factory for deeper options

Clamp mechanism: DC motor. Requires 24 volts DC on surface (or more, depending on cable length). Requires 1/2 amp when moving spring (1 amp peak at clamping)

Expanded diameter: 18 cm (7 in) total diameter including probe body.

BHG-2 Borehole Geophone

Diameter: 48 mm (1.9 in)

Length: 700 mm (27.5 in)

Weight: 2 kg (4 lb)

BHG-3 Borehole Geophone

Diameter: 48 mm (1.9 in)

Length: 1.1 m (44 in)

Weight: 3.4 kg (7 lb)

Compass: fluxgate sensor, powered from same DC voltage as clamp mechanism.

Maximum inclination: +/- 90 degrees from vertical with standard 15-Hz sensors, much less with optional sensors.

Orientation Accuracy: better than 5 degrees

The flux gate compass will not function in steel-cased boreholes.

Cable

6-conductor, Kevlar-reinforced, polyurethane-jacket cable, with connector molded on wet end. 27-pin standard seismograph connector on dry end.

Specifications are subject to change without notice for product improvement or other considerations. For more information, contact:

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Removable connector: The cable is connected to the geophone by a high-pressure, underwater connector. The ability to disconnect the sensor makes it easier to handle and use. A male-female extension cable can be used to temporarily extend the length without permanently attaching a long, bulky cable.



Extenders: For larger holes, extenders are available which also add rotational stability if there is an interest in later arrivals after the initial breaks. They can be easily installed on the tool using existing threaded holes. See the website for further information.

