



VERY BROADBAND
BOREHOLE
SYSTEMS

Flexible design

To ensure you achieve seismic measurement at depth

Borehole installations offer excellent performance for low-noise detection of weak seismic signals such as from local microseismic events or from regional/ teleseismic earthquakes.

We offer a range of options to assist you in achieving measurement at depth, allowing you to get closer to the seismic event and improve the accuracy of sub-surface velocities and event depths.

Our 'very broadband' borehole (VBB) system can house a weak-motion seismometer, a strong motion accelerometer, or a combination of the two.

If the borehole deviates from the vertical path we recommend our Radian system which can be installed at any angle.

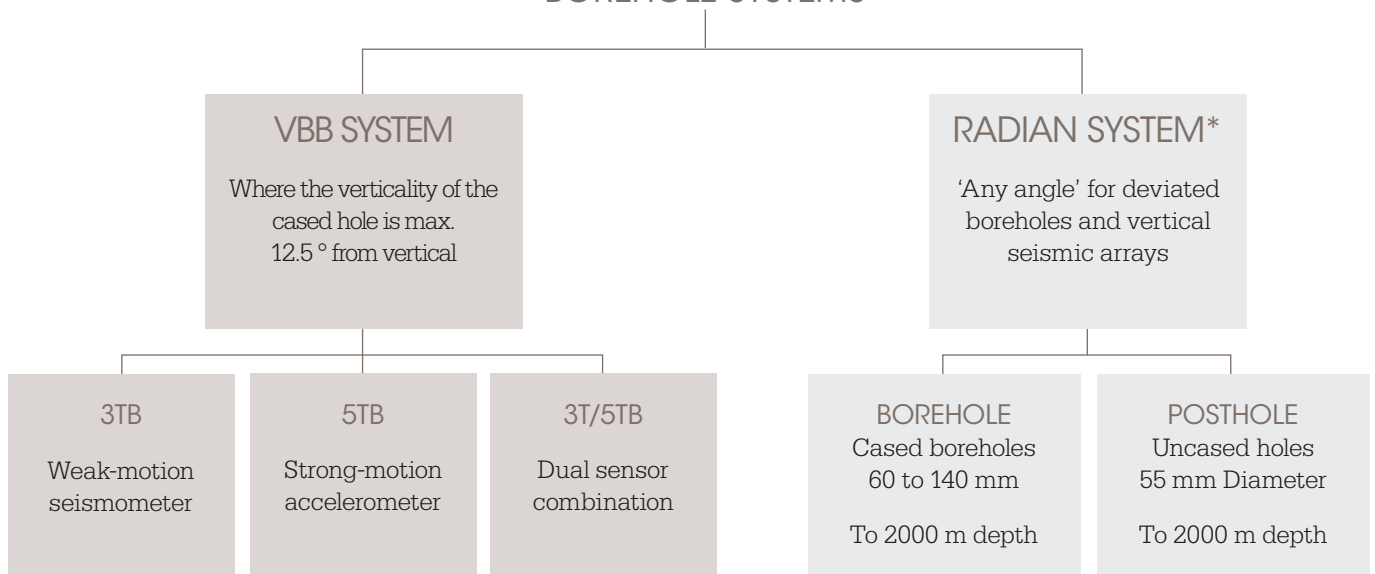
The Radian can also be strung together for vertical seismic profiling (VSP). Please see our separate Radian datasheets for more on this solution.

Through experience, we have learnt that there is a high level of complexity in successfully designing and installing borehole systems. For this reason, we strongly recommend that one of our field engineers is involved in installing Guralp borehole instruments, particularly for a first installation.

If you are considering procuring a borehole instrument we recommend an early discussion with us to explore the full range of available options.



BOREHOLE SYSTEMS



Suitable for a borehole casing diameter of 99 - 203 mm. The depth that can be achieved with the VBB borehole system will depend upon the conditions of the borehole itself e.g. Temperature

*For details on the Radian systems please see the Radian Borehole datasheet (DAS-RAD-0002) and the Radian Posthole datasheet (DAS-RAD-0001)

VBB BOREHOLE SENSORS

A modular design that offers a range of installation possibilities. All combinations are supplied with surge protection and a strain relief mechanism to isolate the sensors in the instrument from motions in the cable.

5TB

The 5T borehole is designed for strong-motion borehole studies. It is fitted with a DC to 100 Hz accelerometer with a full scale output of 2 g as standard (other options are available).



3TB

The 3TB houses our 3T sensor renowned for delivering reliable, high quality performance in long period monitoring applications. Standard response of 120 s - 50 Hz, or 360 s to 50 Hz (other options are available).



3T/5TB

The 3T/5TB combines both sensors in one instrument for simultaneous monitoring of weak seismic signals and near-field, high intensity shaking. It is particularly useful where the shaking has the potential to clip the weak-motion sensor.



THE INSTRUMENTS ARE SHOWN WITH THE OPTIONAL SINGLE JAW HOLE-LOCK - WHICH SECURES THE INSTRUMENT IN THE BOREHOLE AT THE DESIRED DEPTH.

APPLICATIONS

- > Earthquake Early Warning systems
- > Strong motion seismic hazard modelling
- > Studies of ground amplification / attenuation
- > Structural health monitoring

APPLICATIONS

- > National observatories
- > Microseismic monitoring
- > Robust velocity subsurface modelling
- > Teleseismic earthquake monitoring
- > Nuclear test ban treaty monitoring

APPLICATIONS

- > Earthquake Early Warning systems
- > Strong motion monitoring and modelling

BOREHOLE SYSTEM OVERVIEW

No two boreholes are the same

Fortunately, the flexibility of the VBB borehole system means instruments can be installed in boreholes with a diameter ranging between 99 mm and 203 mm.

In most cases, an optional single-jaw hole-lock will be used to secure the instrument in the borehole at the required depth. An improved skid design guarantees the stability of the instrument in the casing.

There is also the option, where the conditions are appropriate, to install the instrument using sand backfill. In these instances, the hole-lock module can be eliminated from the design, reducing the length of the system.

As standard, the instruments are supplied with surge protection and a strain relief mechanism that isolates the sensors in the instrument from motions in the cable.

Deeper deployments with data integrity

For deployments exceeding 100 metres in depth, we recommend the Downhole Minimus digitiser. Digitizing the data at source ensures that the origin can be definitively traced and not subject to attenuation during the travel to the surface; so signals are stronger and more reliable.

The Downhole Minimus, which integrates into the instrument to form a single unit, is an eight channel digitiser. It is connected via fibre optic cable to a surface interface unit which delivers advanced data processing capability and software communications, as well as allowing the user to access waveforms and state-of-health data at the installation location.

Ancillary equipment

We can provide tripods, winches and other equipment designed specifically for borehole installations. We strongly recommend that one of our field engineers is involved in installing Güralp borehole instruments, particularly for a first installation.

Design complexities

Due to the level of complexity in designing a successful borehole system, we have created a 'borehole questionnaire' designed to guide you through the key questions that our engineers will need to consider when designing a suitable system for your project.

You can view the questionnaire online here:
www.guralp.com/borehole-questionnaire

DOWNHOLE MINIMUS

FOR DEPLOYMENTS EXCEEDING 100 METRES, WE RECOMMEND THE INTEGRATION OF A DOWNHOLE MINIMUS DIGITISER MODULE



THE DOWNHOLE MINIMUS CONNECTS TO THE TOP OF THE BOREHOLE INSTRUMENT TO FORM A SINGLE UNIT

A SURFACE INTERFACE UNIT CONNECTS TO THE DOWNHOLE MINIMUS VIA A FIBRE-OPTIC CABLE AND DELIVERS ADVANCED DATA-PROCESSING CAPABILITY AND SOFTWARE COMMUNICATIONS

