güralp

RADIAN POSTHOLE

THE TRIAXIAL, BROADBAND, DIGITAL SEISMOMETER WITH UNPARALELLED FLEXIBILITY FOR SUB-SURFACE INSTALLATIONS

The Radian Posthole system delivers advanced software communications for quick and easy instrument and data management.

KEY FEATURES

> Remote, user-selectable high-pass frequency corner up to 120 s
> Operational at any angle with ultra slim 55 mm diameter enclosure
> Choose either acceleration or velocity response
> STA/LTA and threshold triggering
> The system can incorporate an additional analogue feed if required

APPLICATIONS

> Microseismic and induced seismicity monitoring
> Volcanic unrest monitoring
> Seismic monitoring in areas of high cultural noise
> Strong motion monitoring caused by local events
> Ice-quake monitoring in glaciers

Radian Posthole

At just 55 mm diameter, the Radian Posthole is designed to deliver a plug-in and go approach for efficient seismic deployments in uncased holes in the shallow subsurface.

The Radian instrument houses a triaxial, broadband, digital seismometer that can operate at any angle, making it both simple and cost-effective for subsurface deployment.

The Radian Posthole system includes the Minimus as a surface interface unit to deliver data communication, timing and storage capability. Minimus records data on dual-redundant microSD cards and shares the data via Ethernet and Bluetooth connections.

For added confidence during deployments, the GüVü, Bluetooth App, displays waveforms, orientation, temperature and humidity data.

Record the full spectrum of seismic events for accurate event cataloguing.

Compared to short-period geophones, the Radian's active feedback sensor ensures consistent amplitude and phase response across the bandwidth of the instrument.

Low self-noise and a wide dynamic range allow accurate detection of small seismic events and recording of strong shaking in one instrument.

The ultra-wide frequency response between 120 s and 200 Hz makes the Radian ideal for seismic monitoring at all scales, particularly in areas of high cultural noise. For increased flexibility, the high-pass frequency corner can be remotely configured to suit the deployment environment.

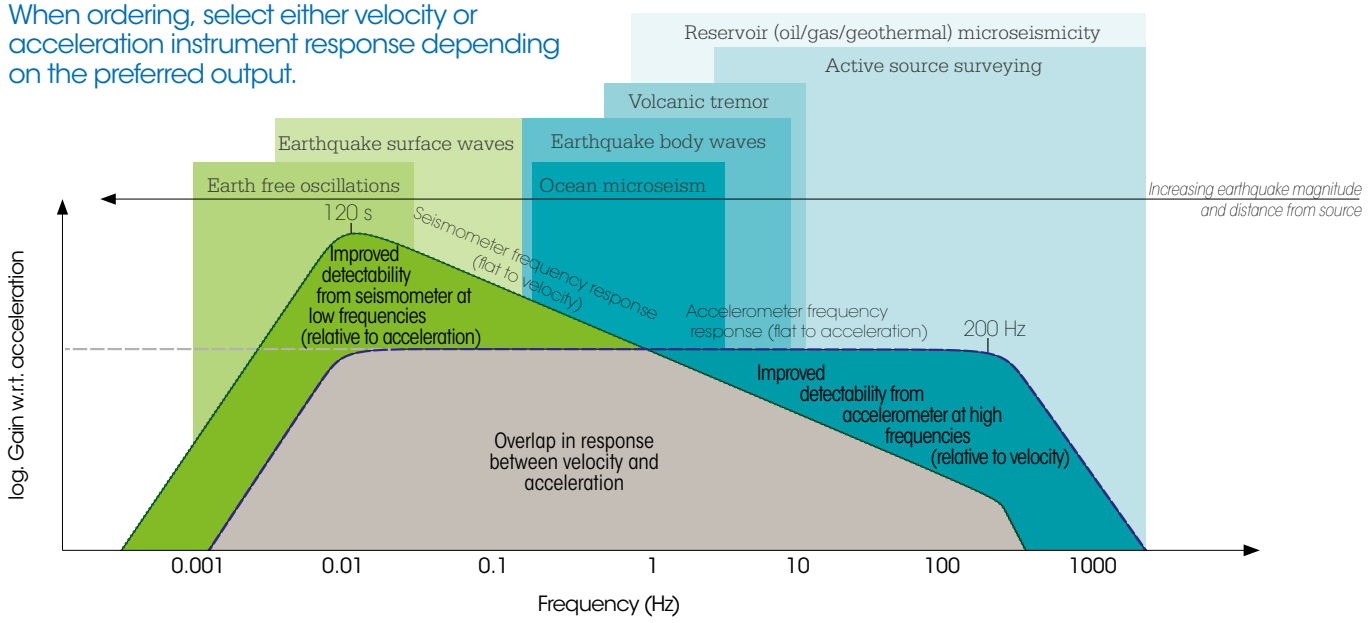
An internal magnetometer and MEMS based accelerometer work together to provide tilt and horizontal orientation. The appropriate correction can be applied to deliver high-quality waveforms with no need for post-processing.

A resilient enclosure constructed from SAE 316 corrosion-resistant stainless steel and a 250 Bar/25 MPa water-proof connector protects the instrument in wet holes.

For installations where back-filling to maximise coupling is not practical, the Radian Borehole with hole-lock mechanisms is recommended. See the Radian Borehole datasheet for more information.

Response selection

When ordering, select either velocity or acceleration instrument response depending on the preferred output.

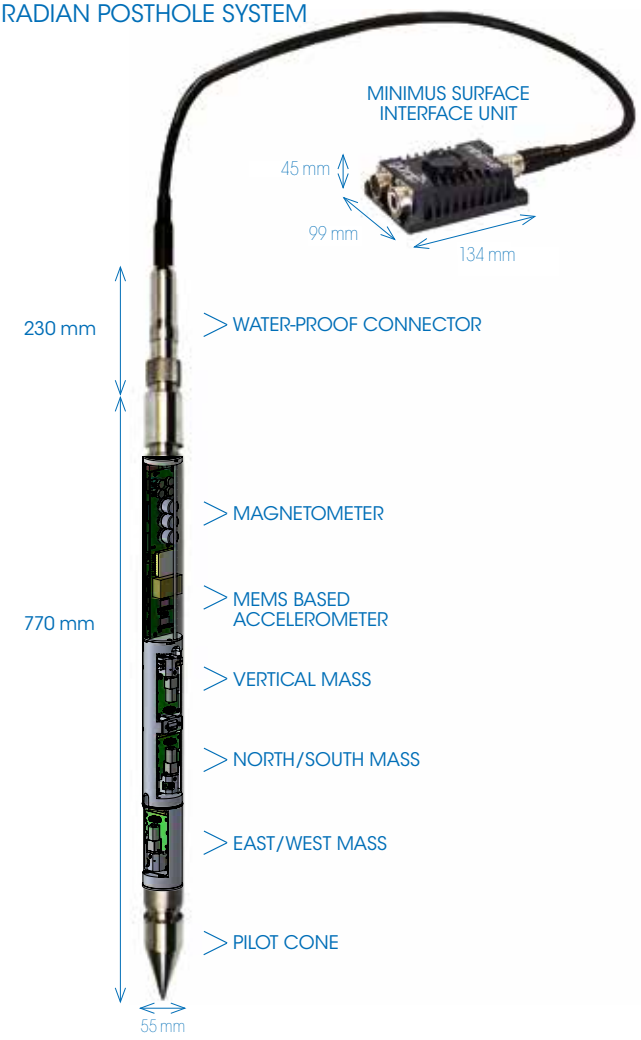


Applications

> Microseismic and induced seismicity monitoring
> Volcanic unrest monitoring
> Ice-quake monitoring in glaciers
> Seismic monitoring in areas of high cultural noise
> Strong motion monitoring caused by local events

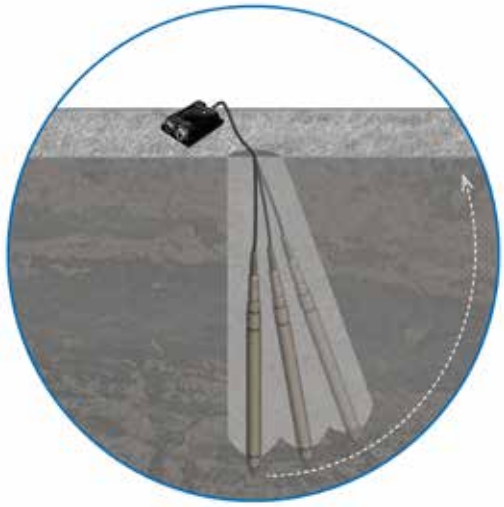
The Güralp Radian Posthole has the flexibility to work at any angle making it simple and cost-effective to deploy in uncased holes. In addition, the Minimus digitiser can accommodate a seperate high performance analogue instrument.

RADIAN POSTHOLE SYSTEM



EASE OF INSTALLATION

- POSTHOLE OPTIMISES NOISE PERFORMANCE
- NO REQUIREMENT FOR PRECISE VERTICAL OR NORTH-SOUTH ALIGNMENT
- BACK-FILL USING SOIL, SAND OR GLASS BEADS TO MAXIMISE COUPLING



MAXIMISE YOUR NETWORK

THE MINIMUS CAN ACCOMMODATE AN ADDITIONAL HIGH PERFORMANCE ANALOGUE SENSOR SUCH AS THE FORTIS ACCELEROMETER - IDEAL FOR EARTHQUAKE EARLY WARNING SYSTEMS

Key features

State-of-the-art seismic sensor allows operation over a full tilt range of ±180° by automatically centring the mass

Triaxial orthogonal (ZNE) instrument with high cross-axis rejection (> 65 dB)

Remote, user-selectable high-pass frequency corner up to 120 s

Customer can select either velocity or acceleration variants depending on the preferred output (configurable prior to shipping)

Slim-line 55 mm diameter enclosure constructed from robust and water-proof, SAE 316 corrosion-resistant stainless steel with a 250 Bar/25 MPa water-proof connector to protect the instrument in wet holes

Low latency outputs available (approx. 0.04 s data packets)

Streaming and storage of instrument response and calibration parameters dramatically simplifies data management (RESP and Dataless SEED formats)

A free GüVü Bluetooth App for checking installation integrity is available for both Android and iOS devices

Dual-redundant 64 GB microSD cards (1 fixed, 1 hot-swappable)

Low power consumption at depths of up to 100 m suitable for temporary deployments using batteries and solar panels

Accurate time-base provided by either surface GNSS, Precision Time Protocol (PTP), or internal clock (< 1 ms drift per day without GNSS)

Radian Posthole

SPECIFICATIONS

BROADBAND SEISMOMETER SYSTEM	
Configuration / Topology	Triaxial orthogonal (ZNE)
PERFORMANCE: BROADBAND SEISMOMETER	
Maximum frequency response bandwidth	120 s (0.0083 Hz) to 200 Hz with user-selectable options available within this range Velocity or acceleration response (configurable prior to shipping)
Full-scale clip level	Velocity response nominal: ±25 mm/s (equivalent to differential output sensitivity of 2000 V/m/s) Acceleration response nominal: ±12.5 mm/s^2 (equivalent to differential output sensitivity of 200 V/m/s^2)
Sensor dynamic range	> 149 dB at 1 Hz
Self-noise	Below NLNM (New Low Noise Model) from 17 s (0.06 Hz) to 9 Hz < -155 dB from 120 s to 10 Hz
Operational tilt range	±180°
Cross axis rejection	> 65 dB
Linearity	> 95 dB
Lowest spurious resonance	> 450 Hz
Centring	Automatic / can be disabled
Transfer function	Measured sensitivity, frequency response and instrument poles and zeros are stored within the instrument and accessible via web interface
ENVIRONMENTAL CHANNELS	
Sensor mass positions	Three independent sensor mass position outputs (integrator)
Orientation sensors	MEMS based accelerometer (three component); Magnetometer (three component)
Other sensors	Temperature; humidity; pressure; input voltage
INTERNAL DIGITISER	
Digital resolution/output format	24-bit
Dynamic range	> 120 dB
Anti-aliasing filter at Nyquist	> 172 dB
Sampling rates	1 to 5000 samples per second, user selectable
DIGITAL SENSOR POWER	
Protection	AC-coupled differential electronics
Power input voltage range	10– 36 V DC
Power consumption (at 12 V DC)	2.1 W*

**Power voltage for operation of this unit only. Connection to additional instrumentation or use of longer cables may result in a higher input voltage requirement*

ENVIRONMENTAL	
Operating temperatures:	-30 to +60 °C
Humidity	0-100% relative humidity
Robustness	IP68 to 2000 m depth
PHYSICAL	
Diameter	55 mm
Case height excluding connector	770 mm (copper cable deployment up to 100 m depth)
Weight	7.1 kg (excl. connector)
Sensor enclosure/materials	SAE 316 corrosion resistant stainless steel Gold plated contacts O-ring seals throughout
Connector	250 Bar / 25 MPa water-proof connector
Sensor and load-bearing cable	Kevlar-refinforced, AC-coupled
Orientation indicator	North vertical scribe mark on side on outer casing and inside connector

MINIMUS (SURFACE INTERFACE UNIT) WITH COPPER CABLE SUITABLE FOR DEPLOYMENTS OF UP TO 100 M DEPTH	
Dimensions	134 mm × 99 mm × 45 mm
Weight	674 g (without connectors)
Operating temperature	-20 to +60 °C
Power consumption	1.45 W (no GNSS or Ethernet) 1.65 W (GNSS with 10 Mb/s Ethernet output)
Additional sensor inputs	Primary channels: Four at 24 bits. Differential input: 40 V peak-to-peak (± 20 V). Also compatible with single-ended inputs: 20 V peak-to-peak (± 10 V)
Secondary channels:	Three analogue channels for sensor mass positions. One internal callibration channel
Internal environmental channels:	Humidity Temperature Supply voltage MEMS accelerometer (three component) Magnetometer (three component)
Flash memory and storage	Dual redundant 64 GB microSD cards (1 fixed, 1 hot-swappable)
Data recording formats	miniSEED (metadata stored in Dataless SEED format)
Configuration and control	(Ethernet) Güralp Discovery - free download, web browser interface. (Bluetooth) GüVu free Android or iOS phone/tablet app
Data streaming protocols (via Ethernet)	GCF (Scream!), GDI-link[1] and SEEDlink[1] ([1]metadata sent in RESP, StationXML and dataless SEED file formats)
TIMING	
Timing protocols	GNSS (GPS or GLONASS, BeiDou optional) or PTP (Precision Time Protocol) timing sources
GNSS connector	14-way Lemo connector (NMEA, PPS and Debug serial)
Timing drift without GNSS	Typical drift when unsynchronised <1 ms per day

FIBRE OPTIC SURFACE INTERFACE UNIT FOR DEPLOYMENTS OVER 100 M

For Radian posthole deployments that are deeper than 100 m, a fibre optic cable and surface interface unit is required.

Our fibre optic surface interface unit can be used for posthole and borehole Radians for depths of up to 2000 m. Power consumption for fibre-optic systems is higher than for copper post-hole systems, full details of the fibre optic system can be found on the Radian Borehole datasheet.

Fibre optic systems must be specified at point of order.

Güralp Systems Limited
Midas House
Calleva Park
Aldermaston
Reading
RG7 8EA
United Kingdom

T +44 118 981 9056
F +44 118 981 9943
E sales@guralp.com

www.guralp.com

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