GaiaCode

NEXT GENERATION

BROADBAND SEISMOMETER

ALPHA α - TA120 - VEL

Figure 1: *ALPHA three component sensor*

ALPHA α - TA120 - VEL is a three component low noise feedback, velocity output broadband seismometer designed by Dr. C.M. Güralp. In 1970 and 1980 Dr. Guralp *(Ref 1), (Ref 3,4)* set out the standards for miniature surface and borehole broadband seismometers *(Ref 2)*.

The seismometer is based on orthogonal three axis low noise sensor modules with double nested feedback loop topology.

The mechanical suspension system is based on the principles of "elastica" and the leaf spring *(Ref 1, 2)* is deployed in a "Zero" length spring topology.

The mechanical sensor orientation is Non-Galperin with >-75 dB cross axis rejection on all axis.

The sensor ALPHA-TA120-VEL frequency response covers complete seismic spectrum with a flat and repeatable frequency response (No peaks) from 0.008333 Hz (120 seconds) to 150 Hz.

Optional Frequency Response VBB sensor, ALPHA-TA120-VEL. Response 0.00277 Hz (360 seconds) to 150 Hz.

The sensor noise level crosses (below) the New Low Noise Model (NLNM) from 18-20 Hz to 180- 220 Seconds period.

Suitable for local, regional and tele-seismic recording.

Truly portable rugged seismometer with fine pitched adjustable feet manufactured from phosphor bronze.

Sensor can be operated with ± 5.0 degrees of tilt, and microprocessor controlled remote centring is provided.

The product specifications and the stated data are subject to change without prior notice.

PHYSICAL

- Remote electronic control of mass lock and unlocking facility, both with serial interface and logic levels.
- Two stage galvanically isolated electronics circuitry.
- The sensor mechanical section and the feedback electronics sections have their own isolated and hermetically sealed enclosures.
- The electronic and the mechanical sections of the sensor can be physically separated for observatory applications. This is an optional feature and the only VBB broadband sensor that can be configured to have separate mechanical and electronics sections.
- Power consumption, less than 1 Watt. Operates from 9 to 36 Volt range, with input power polarity protection.
- All analogue outputs and digital inputs are transient protected.
- The sensor noise level crosses (below) the New Low Noise Model (NLNM) from 18 to 20Hz to 180- 220 seconds period.
- The mechanical sensor section can be installed in a specially carved granite housing for observatory applications.

Figure 2: *Comparison of Alpha and Alpha-Light (Black Casing)*

Figure 3: *Alpha sensor with a control unit, access to serial port, all the analogue outputs and logic control lines*

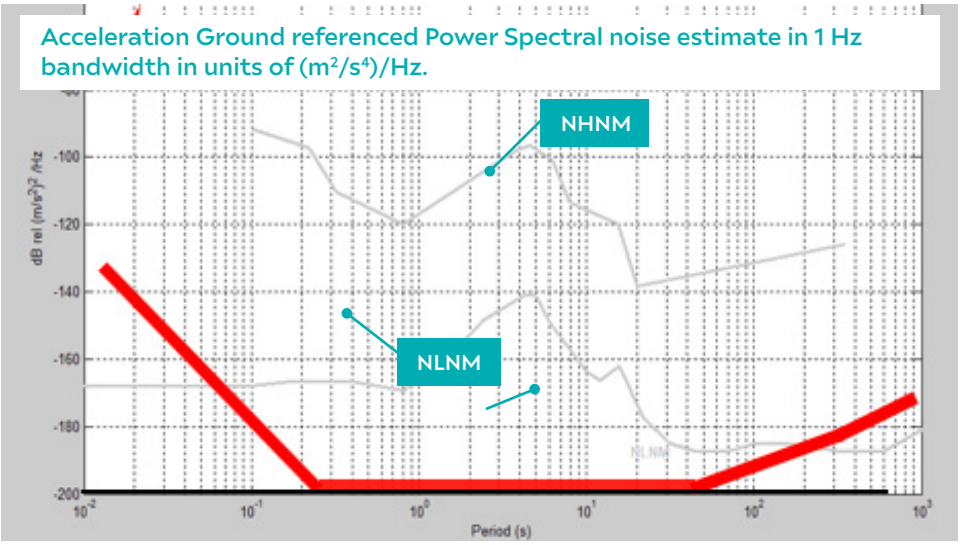

Figure 4:
Red-triple line is the sensor power spectral noise density over the entire seismic spectrum. The black line is the Brownian motion of the mechanical suspension relating to each sensor component with a seismic frame of reference mass of 320 grams.

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TECHNICAL SPECIFICATIONS

Standard Frequency Response:
Flat velocity 0.008333Hz (120s) to 150 Hz

Other optional responses:
0.01666 (60s) to 150 Hz.
0.03333 (30s) to 200 Hz.

VBB Optional Extended Broadband:
Flat velocity 0.002777 to 150 Hz.

Analogue sensor sensitivity:
Differential: 2*1500 V/m/s.
Other responses are available: The sensor sensitivity can be set according to the customer's requirement. Typical sensitivity examples are: 1000 V/m/s. 5000 V/m/s. 10.000 V/m/s and others.

Full scale Velocity outputs:
± 20 Vdc differential velocity.
Other options are available according to the system power consumption requirements.
Ask factory.

Full Scale Mass Position outputs:
± 10 Vdc mass position (Applicable to all the sensor). Other options are available according to the system power consumption requirements.
Ask factory.

SENSOR CONTROL LINES

Mass Lock/Unlock: Serial (RS 232) and Logic lines control.

Centre the sensor mass Potions: Serial (RS 232) and Logic lines control.

Calibration On/Off: Serial (RS 232) and Logic lines control.

Calibration signal: Can be applied to each axis. The calibration signal can be any form of signal.

Feedback Coil Constant: Provided in the calibration document for all the sensor axis. Coil Constant presented in Amp/m/s2. See Ref 1.

Mass Centring Operational Range: ±5 Degrees. Microprocessor control of mass position available via serial RS232 Commands.

Cross axis Sensitivity: -75 dB, In 6 degrees of freedom, all direction).

Linearity: Measured at 1 Hz: -110 dB, (Two-tone THD measurement).

Lowest spurious Resonance:
340 Hz Vertical and Horizontal modules. (in the horizontal modules, difficult to observe spurious modes of resonance).

Operating temperature:
20 to 80 degrees centigrade. Other options are available: -40 to 80 degrees centigrade.

Power Supply:
+9 - +36 V DC, Galvanically Isolated Supply input from the sensor casing.

Power Consumption:
Less than 1 Watts.
Low power option: 365 Milli Watts.

Isolation and transient Protection:
Sensor casing is isolated for the signal ground and sensor input power.

All outputs are transient protected.

PHYSICAL

Dual Chamber casing: Sensor mechanics and electronics are isolated and sealed form the environment. Internal Pressure relief valve provided.

Power/signal connector: Hermetically sealed circular Mil-spec connector on the top cap.

Case diameter: 165 mm

Case height: 284 mm

North South Pointer: Machined to the base. North - Black Pointer. South - White Pointer.

Handle provided: Flexible rubber handle.

Base plate: 316 Stainless steel.

Casing and top cap:
Stainless steel. Environmental: IP-68

Weight: 14.3 Kg

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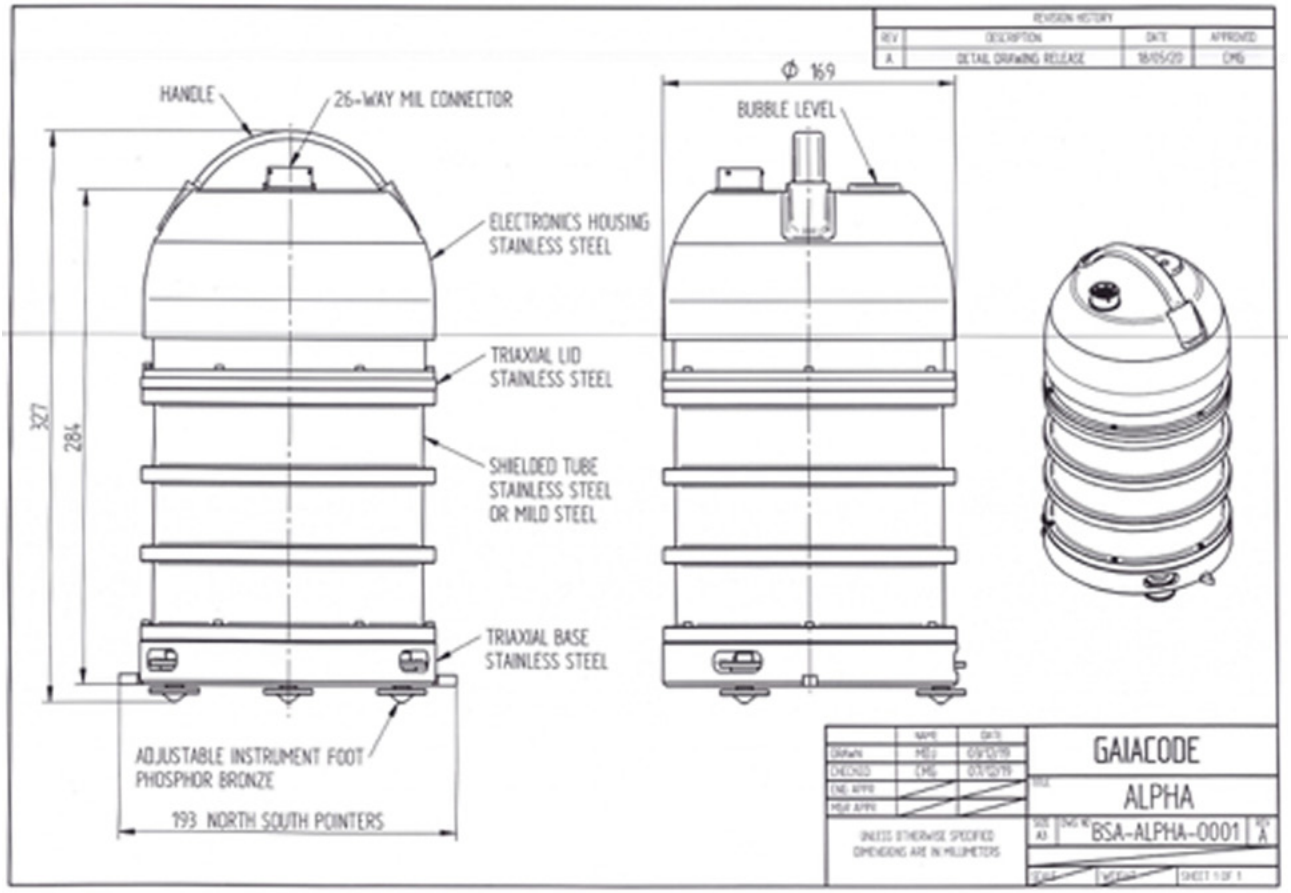

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REFERENCES

Ref 1. GURALP C.M. Patent Application, No: 7909579 Filed: 19th March 1979 (declaration priority from Appln No: 10279/78 Filed: 15th March 1978) "Vertical Seismometer".

Ref 2. GURALP, C.M., "The Design of a Three-component Borehole Seismometer", 1980. Ph.D. Thesis, Univ of Reading.

Ref 3. USHER, M.J., BURCH, R.F. and GURALP, C.M., "Wide-band Feedback Seismometers", 1979. Physics of the Earth and Planetary Interiors, 18: 38-50.

Ref 4. M,J, USHER and C.M. Guralp, "The design of miniature wideband seismometer" Geophys. J.R. ast. Soc. (1978)-55 (605-613).

GaiaCode

www.gaiacode.com

For more information contact us:

Dickers Farm, Bramley Road,
Silchester RG7 2LU, United Kingdom.

Call: **07468 439741**
Email: **contact@gaiacode.com**