

NEXT GENERATION

# BROADBAND SEISMOMETER

## ALPHA $\alpha$ - TA120 - LIGHT

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

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

The suspension system is based on the principles of "elastica". The mechanical sensor orientation is Non-Galperin with -75 dB cross axis rejection on all axis.

The sensor frequency response covers complete seismic spectrum with a flat frequency response (No peaks) from 0.008333 Hz (120 seconds) to 150 Hz.

The sensor noise level crosses (below) the New Low Noise Model (NLNM) from 18-20 Hz to 45-50 seconds period.



### SUITABLE FOR LOCAL, REGIONAL & TELE-SEISMIC RECORDING, INCLUDING:

- Single or Large scale seismic networks
- Micro-seismic monitoring
- After-shock monitoring
- Volcanology
- Hydrocarbon exploration
- Permanent reservoir monitoring
- Induced seismicity detection
- Explosion monitoring
- Post hole seismology
- Micro-seismic monitoring

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

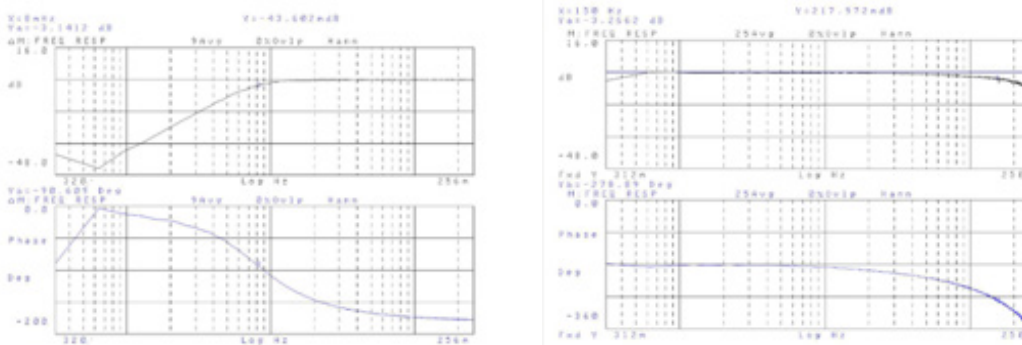
## PHYSICAL

- Truly portable rugged seismometer with fine pitched adjustable feet manufactured from phosphor bronze.
- Sensor can be operated with  $\pm 5.0$  degrees of tilt, and microprocessor controlled remote centring is provided.
- Remote electronic mass locking and unlocking facility, with serial interface for sensor control and parametric sensor data.
- Galvanically two stage isolated electronics. 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.
- Power consumption, less than 1 Watt. Operates from 9 to 36 Volt range, with input power polarity protection.
- All outputs and digital inputs are transient protected.
- The sensor noise level crosses (below) the New Low Noise Model (NLNM) from 18 to 20 Hz to 45 to 50 seconds period.

## SIGNIFICANT QUALITIES AND BENEFITS OF THE SYSTEM

- High data quality broadband data
- Suspension system with high cross axis rejection
- Broadband data with high frequency response extending to 150 Hz
- Automatic self-installation and zeroing for quick installation
- Tilt tolerance of  $\pm 5$  degrees
- Portable and easy to deploy
- Waterproof with connectors mated

## MEASURED FREQUENCY RESPONSE OF THE DIGITAL SENSOR



Note: The measured frequency response is given as low and high frequency sections in order to identify accurately the corner frequency of the transfer function.

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Acceleration Ground referenced Power Spectral noise estimate in 1 Hz bandwidth in units of  $(m^2/s^4)/Hz$ .

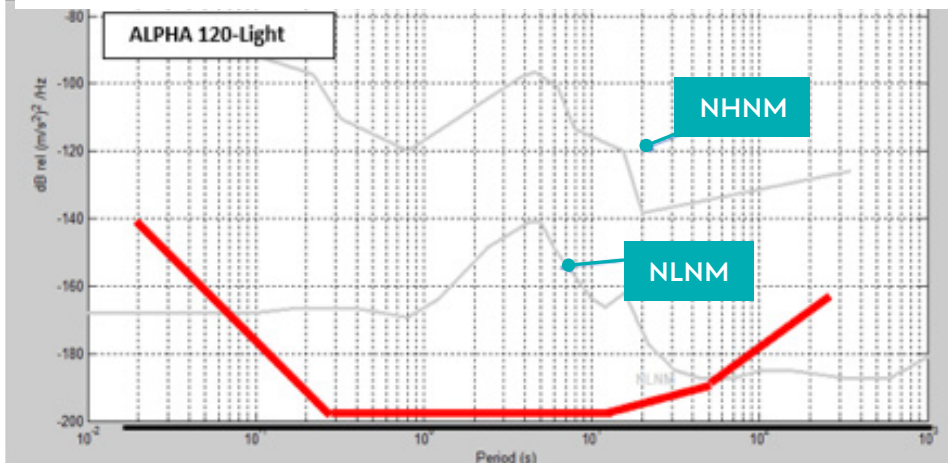


Figure 1:  
Red line is the sensor power spectral noise density estimate over the entire seismic spectrum. The black line is the Brownian motion of the mechanical suspension relating to each sensor component with a frame of reference mass of 0.320kg.

## 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. The sensitivity, in V/m/s can be, given as examples: 1000 V/m/s. 5000 V/m/s. 10.000 V/m/s and others.

### Full scale Velocity outputs:

$\pm 20$  Vdc differential velocity. Other options are available according to the system power consumption requirements. Ask factory.

### Full Scale Mass Position outputs:

$\pm 10$  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 enable via serial port.

**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/s<sup>2</sup>. See Ref 1.

**Mass Centring Operational Range:**  $\pm 5$  Degrees. Microprocessor control available via serial RS232 Control.

**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. (Horizontal Modules, cannot observe spurious modes of resonance)

### Operating temperature:

-20 to 75 degrees centigrade.

### Power Supply:

+9 - +36 V DC, Galvanically Isolated Supply input.

**Power Consumption:** Less than 1 Watts.

Low power option: 365 Milli Watts.

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**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 from the environment. Internal Pressure relief valve provided.

**Power/signal connector:** Hermetic Mil-spec connector on top cap. KPT 02E-16-26P.

**Case diameter:** 165 mm

**Case height:** 284 mm

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

**Handle provided:** Flexible silicone handle.

**Base plate:** 316 Stainless steel.

**Casing and top cap:**

Hard Anodised Aluminium. Environmental: IP-68

**Weight:** 10.5 Kg



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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).