

NEXT GENERATION

POSTHOLE DIGITAL BROADBAND SEISMOMETER

ALPHA α - TAD120 - LIGHT

ALPHA α - TAD120 - LIGHT is a three component low noise feedback, digital output velocity broadband seismometer designed by Dr. C.M. Güralp. In 1970 and 1980 Dr. Güralp 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.

A precision 24 bit 8 channel digitiser is housed inside waterproof enclosure.

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



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

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
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PHYSICAL

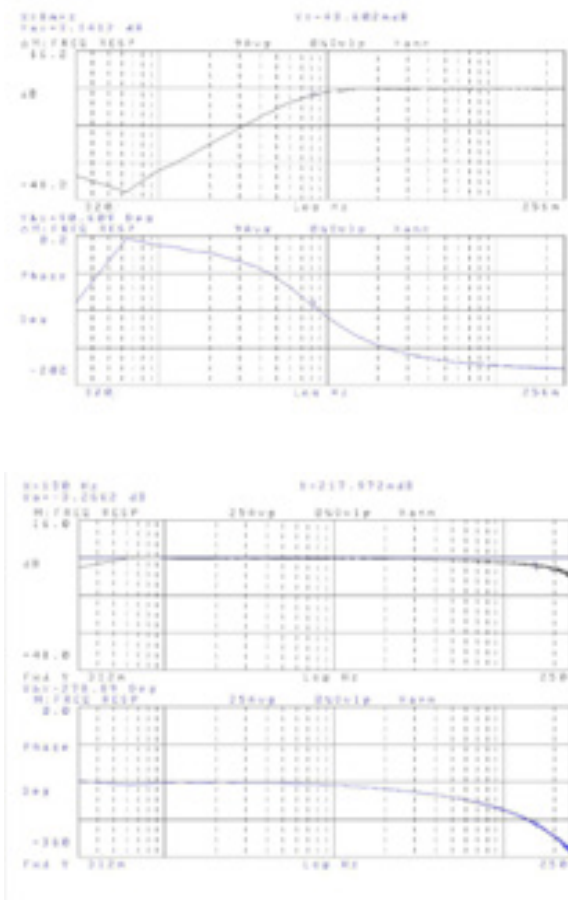
- Truly portable rugged seismometer with fine pitched adjustable feet manufactured from phosphor bronze.
 - Sensor can be operated with ± 5.0 degrees of tilt, and microprocessor controlled remote centring is provided.
 - Remote electronic mass locking and unlocking facility, with serial interface for 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.
 - All outputs and digital inputs are transient protected.
 - Alpha Light sensor noise level crosses the New Low Noise Model (NLNM) (below) from 18 Hz to 50 seconds period.
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SIGNIFICANT QUALITIES AND BENEFITS OF THE SYSTEM

- High digital data quality broadband data
- Covers complete seismic spectrum with a single transfer function
- Particularly low noise at high frequencies compared to other Board band sensors
- 8 Channel 24 Bit internal digitiser
- PGA On all channels
- Remotely configurable and controls sensor functions
- TCP/IP protocol, resume from the breaking-point, multiple access transmission and retrieving
- Automatic centring based on mass position offset
- Sate of Health (SOH) for the system monitoring
- Real-time data to data center and recording locally
- Data analysis software for Filter, PSD, Calibration calculation, Orientation, Self-noise
- 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 ± 5 degrees
- Portable and easy to deploy
- Waterproof casing with connectors mated

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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.

TECHNICAL SPECIFICATIONS

Standard Frequency Response:

Flat velocity 0.008333Hz (120s) to 150 Hz.

Other optional responses:

0.008333Hz (120s) to 100 Hz.

0.01888 (60 s) to 150 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: 2*1000 V/m/s, 2*3000 V/m/s, 2*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.

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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/s². See Ref 1.

Mass Centring Operational Range: ±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).

TIME SYNCHRONIZATION

Time Source:

GPS, GNSS, NTP or internal source.

GPS: Maximum 50 meters cabling.

Timing Accuracy: ±<50 Nanoseconds

NTP: NTP option software selectable.

USER INTERFACES

Available interfaces:

10/100 Base-Ethernet, USB, Serial RS232.

RS232 Serial input:

Control and acquire digital data. Interface to e.g.: Weather stations, digital infrasound sensors, digital strain/stress gauges.

Logic Control Lines:

Calibration enable and centre via serial interface.

IP Addressing: Static, dynamic (DHCP).

Protocols: TCP/IP unicast/multicast.

DIGITAL RECORDER MODULE

Operational Performance

Independent 8-24 bit Delta Sigma Digitizer with simultaneous sampling.

Dynamic Range:

Sample rate: 1K Hz: >-122.2dB, at:100 Hz:>-136.5 dB, at: 10 Hz >-138.4dB.

(Full scale P-P to RMS Shorted input Noise)

Gain Accuracy:

± <0.5%, Each channel calibrated.

Configurable Preamplifier (PGA):

Gain settings *1, *2, *4, *8 *12.

Sample rates:

User selectable sample rates: 1

2,5,10,20,40,50,100, 125,200,250,500,1000. Four separate same rates are available concurrently.

Calibration signal:

24 bit buffered output DAC with adjustable amplitude.

Wave forms:

Square, Sine, Step, Pulse with duty cycle and frequency control and Pseudo random signals.

Generated with an internal synthesizer.

Decimation Filter Options:

Causal (minimum phase) and a-causal (linear phase) filters, applicable to all the sample rates and concurrently available.

Digital filters:

User selectable, high pass and band pass digital filters.

DATA STORAGE

Format: MiniSEED ,PCF (Proprietary

data Format) and GCF. Other data formats are available with conversion software

Internal Memory: 2 G Byte

Data Storage: 32 G Byte SD card. Data downloadable via USB or Ethernet.

Internal storage Memory: 32 G Byte SD card.

Optional External USB storage: 32G Byte

TRIGGERS:

Threshold trigger with high-pass filter.

User selectable high pass filter.

STA/LTA: Band passed ratio-metric trigger.

Concurrently available in addition to continuous data streams.

Operating temperature:

-20 to 75 degrees centigrade.

Power Supply:

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

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Power Consumption: Less than 2.1 Watts

Isolation and transient Protection: Sensor casing is isolated as signal ground/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.

Connectors: Hermetic Mil-spec connector on top cap.

Case diameter: 165 mm

Case height: 304 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 3m for 48 hours. long term submerge below 200mm

Weight: 11.5 Kg



Figure 1:
Analogue ALPHA-LIGHT sensors.

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

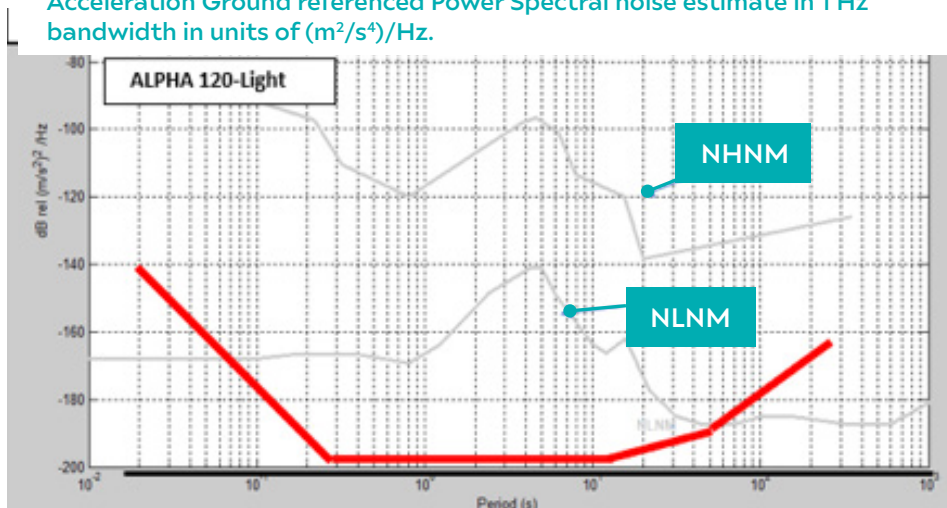


Figure 2:
Red line is the sensor power spectral noise density estimate over the entire seismic spectrum. The black line is the Brownian motion of the mechanical suspension relating to each sensor component with a frame of reference mass of 0.320kg.

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