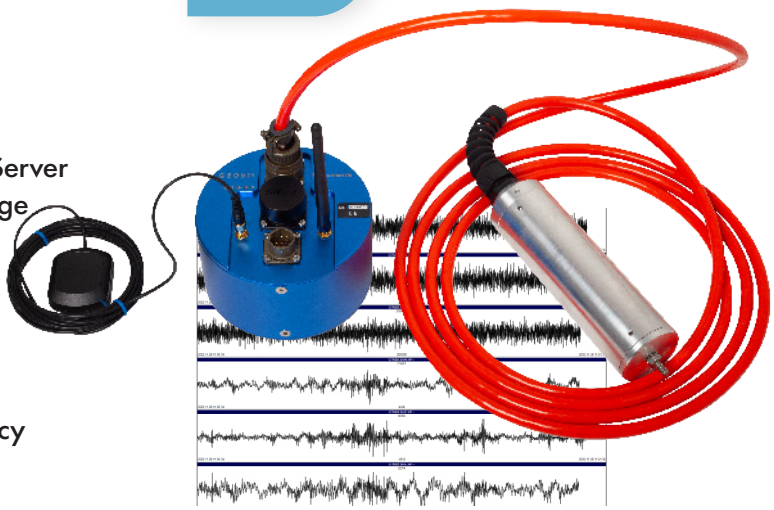
GEOtinyBH10

Borehole Compact Digital Seismometer

Monitoring the earth

- 3C borehole seismic and 3C acceleration sensor
- DR: 146dB velocity. 97dB acceleration
- Wide response V:10s to 98Hz, A:DC-550Hz
- Low power consumption
- Cost affordable design
- Only 130mm D/60mm H
- Integrated 24bit digitizer, 138dB
- Embedded Seedlink & Earthworm Server
- Realtime Telemetry and Local Storage
- MiniSeed data format
- Linux open source OS
- Web Interface Menu
- SSH, SFTP, HTTPS, CoAP, NTP
- Modular seismic sensor design
- Customized Sensor Corner Frequency
- High sensitivity 1500V/m/s
- Operation Range: -20 +70°C
- Waterproof IP67 aluminum case

Pay Less
Get more!

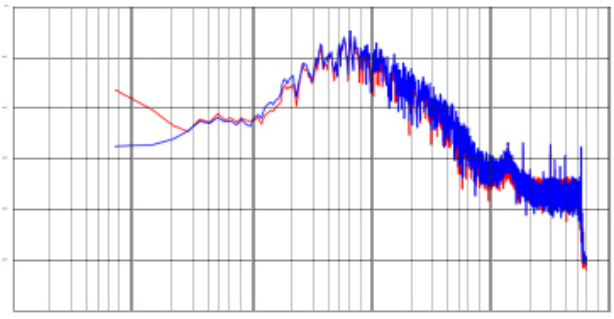


GEObit introduces world's lowest price, compact digital borehole seimometer which integrates borehole seimic and surface acceleration sensor, 24bit digitizer, local data storage and Seedlink Server for data telemetry.

FEATURES

GEOtinyBH10 is a compact miniature digital seismometer which integrates three seismic and three acceleration channels. It supports high resolution 24bit digitizer, embedded linux OS and GPS or NTP timing. Seedlink server ensures reliable real time data telemetry while large storage volume ensures long period local data recording. The instrument has very low power consumption so it can operate getting powered from a small 12Vdc battery. Due to its small size provides the ability to be buried underground.

Modular sensor interface allows the user to select between a variety of sensor types and frequency corners (10sec, 5sec, 2sec, 1sec, 2Hz, 4,5Hz), thus covering the short period and wide band seismic range. Additionally, the user can select between two preset low corner frequencies like 10sec and 1 sec. The transition is done from the webUI. Design simplicity is the great advantage and it is reflected to the price which is only fraction of the common commercial seismometers. The user is able to deploy even 100% more units than using common seismometers at same cost.



Sensor PSD compared to a Guralp3T 120Sec sensor RED– GEOtiny, BLUE – 120sec seismometer

- Aftershock monitoring
- Regional seismicity monitoring
- Seismic tomography acquisition
- Induced seismicity monitoring
- Volcano monitoring
- Structural monitoring
- HVSR, MASW surveys
- Global Earthquake Monitoring
- Educational seismograph
- Personal seismograph

INSTRUMENT SPECIFICATIONS

GEOtinyBH10 TINY BOREHOLE DIGITAL SEISMOMETER

DIGITIZER

Channels	Three seismic and three acceleration channels
A/D converter	Fourth Generation, Delta-Sigma, 24bits
Nonlinearity	+/-0.001%
Modulator	Fourth Generation, 4th order Delta-Sigma Modulator
Filter	Programmable , FIR filtering
Analog Input	Modular sensor board
Sampling Rate	1 tp 1000 samples per second
Power	9-18Vdc , or 9-36Vdc 0.8W, 0.95 with integrated sensor board
Autonomy	One week powered from a 12V/9Ah battery, 36days powered from a 12V/55Ah car battery
RMS Noise	138dB @ 100sps

PHYSICAL (SEISMIC SENSOR)

Type	Borehole Type, 50mm dia X 160mm H
Dimensions	130mm diameter x 60mm length
Cable Length	Standard 5 meters, up to 20 meters
Mounting	BH Sensor: Elastic Packer
Weight	1.2kgr
Tilt	+/-10 degrees

TIME BASE

Type	GNSS receiver (GPS, GLONASS, WAAS, EGNOS, BeiDou, QZSS)/DPLL, GPS port
Accuracy Time	+/-1usec to UTC time pulse, +/-5 meters to position
Timing Sources	GPS, RTC, NTP
DPLL Drift	Less than 17usec between one hour GPS cycles

COMMUNICATION

Telemetry	SEEDlink
Connectivity	Ethernet port, WiFi
LED	5 high brightness LEDs monitoring system SOH
Protocols	SSH, FTP, SFTP, Web Interface, TCP/IP, HTTP, HTTPS, PPP,MQTT, CoAP/CoAPS, NTP

INTEGRATED FORCE-BALANCE SENSOR ELECTONICS (modular)

Bandwidth	10sec–120Hz, variable frequency corner (10s, 5s, 2s , 1s, 2Hz , 4.5Hz)
Technology	Electro-dynamic Force–Balance technology
Sensitivity	1500V/m/sec , Acc: +/-2g, +/-4g,+/-8g
Dynamic Range	Velocity >142dB, Acceleration > 97dB

DATA RECORDING

Media	Internal flash and Removable USB stick
Data File Type	Miniseed
Information File	System log file
Recording Mode	Continuous/Trigger or both

ENVIRONMENT (DIGITIZER/RECORDER)

Temperature range	-20 to +70 °C
Humidity	100%, IP67 enclosure

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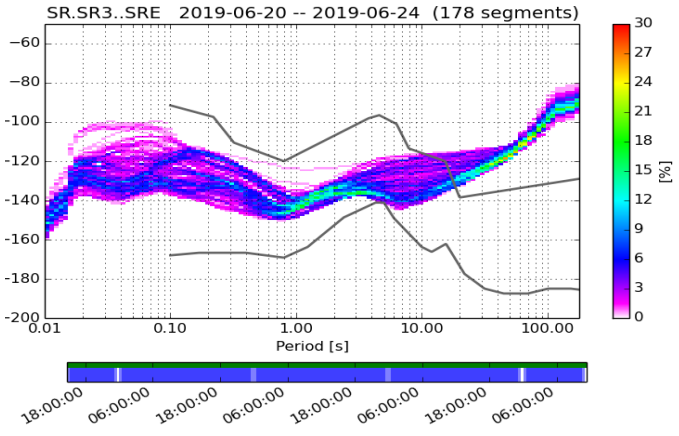
C100
Wide Band Seismometer 10sec - 98Hz

Monitoring the earth

- 3 axis velocity sensor
- Low power consumption
- Borehole/surface type
- Only 50mm diameter
- Up to 150m depth
- Smart elastic clamping
- Guiding wheels driver
- Wide input voltage range
- Build-in test line
- Wide response 10sec - 98Hz
- High sensitivity 1500V/m/s
- Velocity feedback design
- Operation Range: -20 +70°C
- Local & regional seismicity monitoring

FEATURES

The C-100 is a three-component velocity equivalent output seismic sensor. The unit is recommended for local and regional seismicity and microseismicity monitoring. **The sensor electronics are integrated into the GEOthree/sixL digitizer. This makes the difference with the S-100 unit.** The design is based on the force-balance principle. Using three geophone elements, the bandwidth is extended to lower frequency than the original geophone natural frequency. Three generations of the C-100 sensor have been manufactured so several low and upper corner frequencies are provided through different sensor configuration. 10s, 5s, 2s and 1s low cut corner frequency is available as well as 50, 80 and 98 Hz high corner frequency. The sensitivity is 1000V/m/sec for the Mk1 version while it has been increased to 1500V/m/sec for the Mk2 and Mk3 versions. The default cable length of the sensor is approximately 20 meters but it can be extended up to 150 meters. The sensor electronics are housed outside the sensor casing in a separate box (S100 model) or a datalogger (C100/GEOthree/six) thus the damage risk is dramatically minimized. Two sensor types are provided, one borehole type and one surface type. Both have similar characteristics. The borehole type is housed into an 50mm diameter casing while the surface type unit's dimensions are only 115x90x55mm. No mass-lock or centering is required that makes an easy connection with the digitizer. The settling time of the unit is very short, only thirty seconds. Sensitivity is 1500V/m/sec (differentially) thus providing a very sensitive seismic sensor. A test line is also provided for calibration and testing. The sensor is ideal for local and regional earthquake seismology as well as human or induced microseismicity monitoring.



INSTRUMENT SPECIFICATIONS

GENERAL

Number of channels	3
Orientation	Vertical, North-South, East-West
Geophone resistance	375 OHms
Mounting	Borehole type

PHYSICAL

Cable length	Standard 20m, up to 150m
Size (geophone enclosure)	180mm length, 50mm diameter
Weight (geophone enclosure)	600g

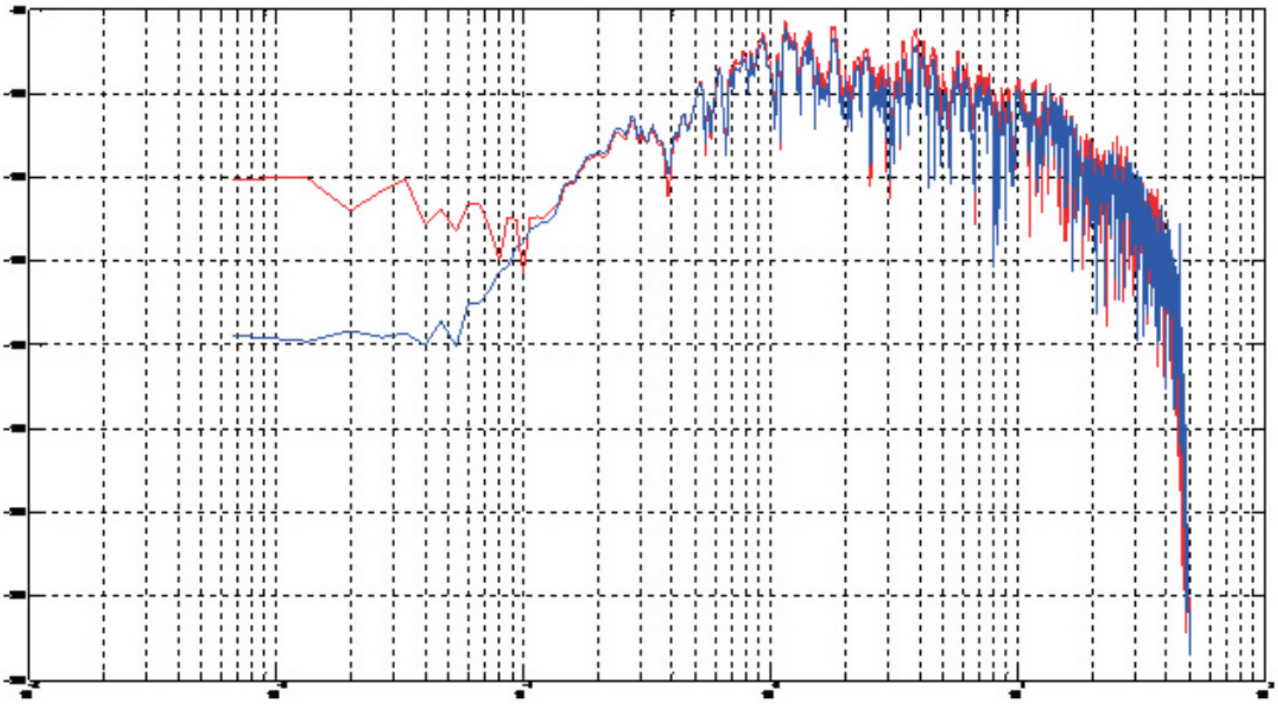
FORCE BALANCE ELECTRONICS

Sensitivity	1500 V/m/sec
Noise Level	Below NLNM into recording band
Bandwidth	4.5Hz , 10sec to 98Hz if connected to GEObit electronics

ENVIRONMENT

Temperature Range	-20 to +70°C
Humidity	100%, IP67 enclosure
Submersible	1000 meters

Optional versions with corner frequency 1sec, 2sec and 5sec are available



C100 (red) vs Guralp3T (blue) PSD plot

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S100
Wide Band Seismometer 10sec-98Hz

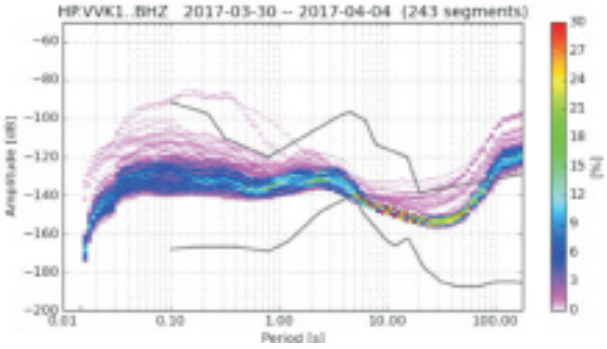
GEObit
Monitoring the earth

- 3 axis velocity sensor
- Low power consumption
- Borehole or surface type
- Only 50mm diameter
- Up to 150m depth
- Smart elastic clamping
- Guiding wheels driver
- Wide input voltage range
- Build-in test line
- Wide response 10sec-98Hz
- High sensitivity 1500V/m/s
- Velocity feedback design
- Operation Range: -20 +70°C
- Local & regional seismicity monitoring

FEATURES

The S-100 is a three-component velocity output seismic sensor. The unit is recommended for local and regional seismicity and micro-seismicity monitoring. The design is based on the force-balance principle. Using three geophone elements and using electronics the bandwidth is extended to a lower frequency than the original geophone's natural frequency. Actually, three generations of the S-100 sensor have been manufactured. Several values of low and upper corner frequencies are provided through different senor configuration so 10s, 5s, 2s and 1s low frequency corner as well as 50, 80 and 98 Hz high frequency corner are available. The sensitivity is 1000V/m/sec for the Mk1 version and it has been increased to 1500V/m/sec for the newer Mk2 and Mk3 versions. Lower sensitivity is also available upon request.

The default cable length of the sensor is approximately 5 meters (BH) but it can be extended up to150 meters. The sensor electronics are housed inside the back box leaving the sensor body free of electronics. Any damage risk is dramatically minimized using this topology. Two sensor types are provided, one borehole type and one surface type. Both have similar characteristics. The borehole type is housed into an 50mm diameter casing while the surface type unit's dimensions are only 115x90x55 mm. No mass-lock or centering is required that makes easy the connection with the digitizer. The settling time of the unit is very short, only thirty seconds. A test line is also provided for calibration and testing. The sensor is ideal for local and regional earthquake seismology as well as human or induced micro-seismicity monitoring.



INSTRUMENT SPECIFICATIONS

GENERAL

Number of channels	3
Orientation	Triaxial Vertical, North-South, East-West
Geophone resistance	375 OHms
Power	+12Vdc/0.2W (9-18Vdc) +/-12Vdc/0.09W
Mounting	Borehole type/Surface type(BH/ST)

PHYSICAL

Cable length	Standard 5m(S100_BH), 3m(S100_ST)
Size (geophone enclosure)	180mm length, 50mm diameter(BH), 120mm height, 130mm diameter (ST)
Weight (geophone enclosure)	600g(BH), 1100g(ST)

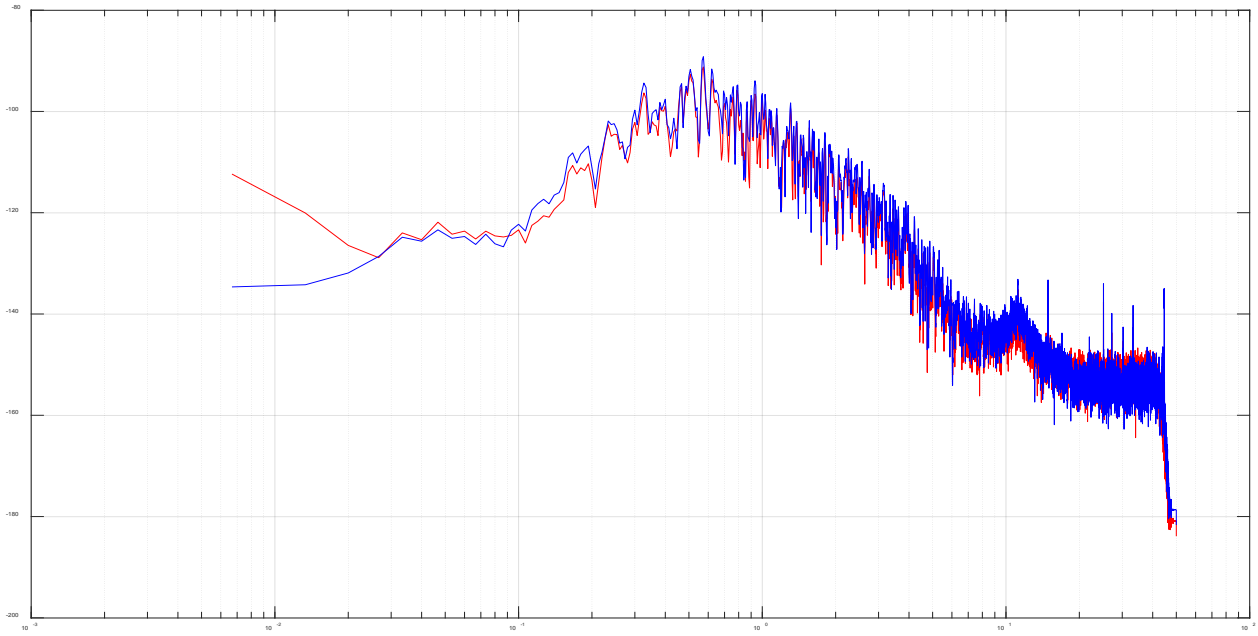
FORCE BALANCE ELECTRONICS

Sensitivity	1500 V/m/sec (optional different sensitivity can be set under request)
Noise Level	Below NLNM into recording band
Bandwidth	10sec to 98Hz (or 5s,2s 1s, 4.5Hz low cut)
Dynamic Range	>136dB

ENVIRONMENT

Temperature Range	-20 to +70°C
Humidity	100%, IP67 enclosure
Submersible	1000 meters (BH), 0.5m (ST)

Optional versions with period 1sec, 2sec, 5sec and 4.5Hz are available



C100 (red) vs Guralp3T (blue) PSD plot

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S200
Short Period Ultra Sensitive Seismic Sensor

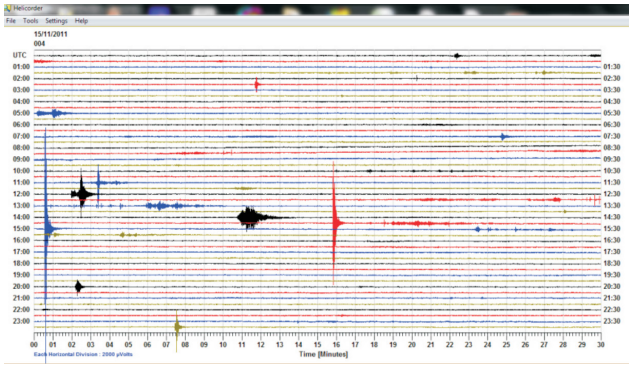
GEObit
Monitoring the earth

- 3 axis velocity sensor
- Low power consumption
- Borehole/surface type
- Only 50mm diameter
- More than 1km depth
- Smart elastic clamping
- Guiding wheels driver
- Wide input voltage range
- Build-in test line
- Wide response 1sec-240Hz
- High sensitivity 1500V/m/s
- Velocity feedback design
- Operation Range: -20 +70°C
- Micro-seismicity monitoring

FEATURES

The S-200 is a three-component velocity output seismic sensor. The unit is recommended for local micro-seismicity and fracturing seismicity monitoring. Three versions of this sensor type are available. One without electronics (S200A), one with preamplifier (S200B) and a third one with signal conditioner (S200C) based on the force-balance principle. This third version provides wider sensor response 1sec to 130Hz. The main characteristic of this sensor type is the high sensitivity combined with very low noise level. It is ideal for very small seismic events recording or fracturing events recording. The sensor must be combined with a very low noise/high dynamic range digitizer like the GEOthree or GEOsix units.

The default cable length of the sensor is approximately 20 meters. Selecting special cable, the length can be extended to more than one kilometer. The sensor electronics are housed into a back box thus the main sensor body is free of electronics. Any damage risk is dramatically minimized because of this topology. The borehole type unit is housed into an 60 or 80mm diameter casing. The sensor body is filled with special electro-insulated resin with excellent hydrolytic stability and therefore the sensor can be installed in deep boreholes. Corrosion environment is not a problem for this sensor. No mass-lock or centering is required that makes an easy connection with the digitizer. Sensitivity is 1500V/m/sec (differentially) if electronics are used, thus providing a very sensitive seismic sensor. Recording fracturing events from the surface is not an easy experiment, almost impossible using ordinary equipment. Efforts were concentrated on minimizing the noise floor, increasing the downhole gain and the sensor sensitivity. This sensor uses double geophones per axis so it meets all the requirements of gain and noise levels and its sensitivity becomes double of using a single sensing element per axis.



INSTRUMENT SPECIFICATIONS

MODEL S200A (without electronics)

Number of channels	3channels, Vertical, North-South, East-West
Channel Resistance	6800 OHms
Sensitivity	176 V/m/s
Natural Frequency	4.5Hz (10Hz, 14Hz, 28Hz, 35Hz under request)
Open circuitdamping	0.76
Cable length	More than 1km
Size	460mm length, 60mm diameter
Weigh (geophone enclosure)	3400g

MODEL S200B (with preamplifier)

Number of channels	3channels, Vertical, North-South, East-West
Channel Resistance	500 OHms
Sensitivity	1500 V/m/s
Natural Frequency	4.5Hz (10Hz, 14Hz, 28Hz, 35Hz under request)
Power	12Vdc, 41mA (0.49W)
Cable length	More than 1km
Size	460mm length, 60mm diameter
Weigh (geophone enclosure)	3400g

MODEL S200C (with signal conditioning electronics - bandwidth extended)

Number of channels	3channels, Vertical, North-South, East-West
Channel Resistance	500 OHms
Sensitivity	1500 V/m/s
Natural Frequency	1Hz (0.5Hz, 0.2Hz under request)
Power	12Vdc, 43mA (0.49W)
Cable length	More than 1km
Size	460mm length, 80mm diameter
Weigh (geophone enclosure)	3400g

ALL MODELS GENERAL CHARACTERISTICS

Mass lock, centering	Not required
Temperature range	-20 to +70°C
Humidity	100%, IP68 enclosure, resin filled
Submersible	>1000 meters

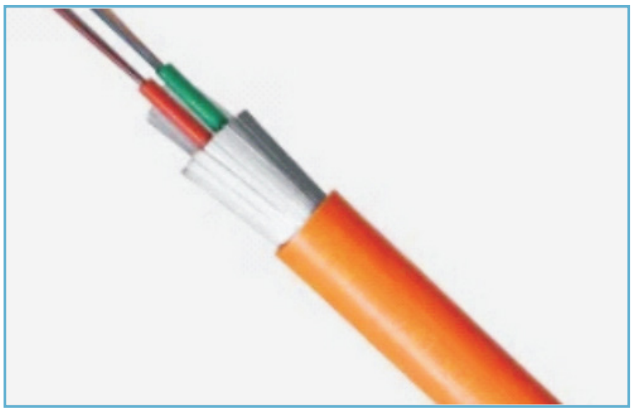
RESINE SPECIFICATIONS (+stable, -unstable)

Water +	Hydrocholic acid 5% +
Potassium hydroxide 5% +	Unleaded fuel +
Sodium Hydroxide 5% +	Diesel Fuel +
Salt water 20% +	Xylene +
Domestic Dedergents +	DMSO -
Sulfuric acid 5% +	N-Methyl pyrrolidone -
Temperature -40 to +100	Solid 100%

CABLE SPECIFICATIONS

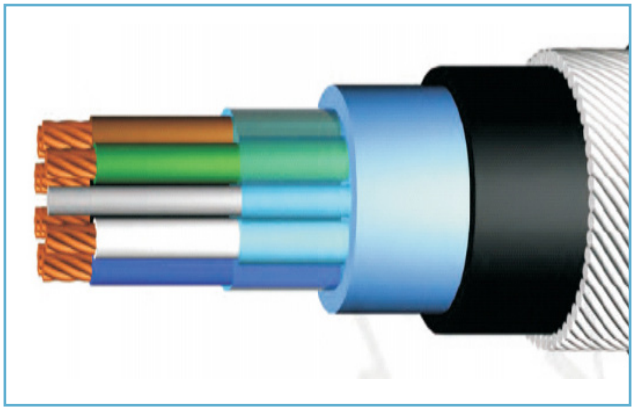
KEVLAR SEISMIC CABLE

Conductor	6*0.32 tinned cooper DCR<36Ohms
Insulation	HDPE O.D 1.5mm
Twisted	Red/Black, Blue/White, Red/blue
Shield	Tinned Copper Braided 16x8x0.1
Strength	Kevlar, >350kg
Jacket	TPU85A, OD 10mm
Color	Orange, Yellow
Weight/km	160kg



STEEL ARMOURED SEISMIC CABLE

Conductor	2x5, 0.5mm2
Insulation	Individually screened conductors
Twisted	2x5 conductors
Shield	PVC bedding, galvanized steel wire armour
Strength	Steel, >350kg
Jacket	PVC 20mm
Color	Black
Weight/km	730kg



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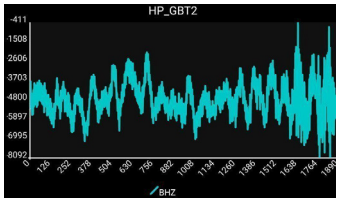

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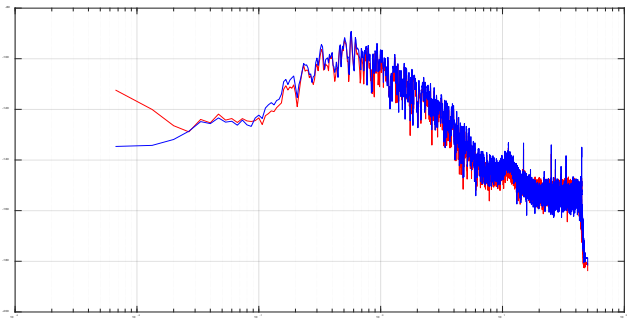

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Timing Sources	GPS, RTC, NTP*
DPLL drift	Less than 17usec between one hour GPS cycles

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Dynamic Range	Velocity >142dB, Acceleration > 97dB

PHYSICAL (SEISMIC SENSOR)

Type	Surface Type
Dimensions	130mm diameter x 115mm length
Cable length	Standard 5 meters, up to 50* meters
Mounting	Three adjustable legs
Weight	2.6kgr
Tilt	+/-10 degrees

ENVIRONMENT (DIGITIZER/RECORDER)

Temperature	-20 to +70°C
Humidity	100%, IP67 enclosure

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