VECTORSEIS ML21/MT21

FEATURES
- INOVA’s industry-leading multicomponent, digital sensor
- Patented MEMS accelerometers to record X, Y, and Z data
- Enables measurement of true ground motion by recording the full seismic wavefield
- Compatible with INOVA’s G3i® HD and Hawk® acquisition systems
- Single-point receivers to facilitate the imaging of anisotropic reservoirs
- Tilt-insensitivity enables faster deployment of sensors in comparison to geophone arrays
- Reinforced with a more robust and rugged mechanical housing, including a 60% stronger case to withstand operational and environmental wear and tear
- 20% power consumption improvement over first generation VectorSeis
- Response down to DC by deselecting low-cut filters
- New MT21 design supports marsh applications

TECHNICAL SPECIFICATIONS

Digital Quantization: 24 Bits (23 + Sign)

Sample Rate: 4 ms, 2 ms or 1 ms
0.5 ms with compatible systems

Time Standard: Phase locked to acquisition system clock

Full Scale (peak)
(Normal Mode): +/- 3.3 m/s² (at all inclinations)
(Strong Motion Mode): +/- 13.1 m/s² (source radius enabled with compatible systems; at all inclinations including gravity and offset)

Noise (Normal Mode): 0.4 μm/s²/√Hz
3 Hz to 375 Hz

Equivalent Input Noise (EIN)
(Normal Mode): 4.18 μm/s² @ 4 ms
5.95 μm/s² @ 2 ms
8.46 μm/s² @ 1 ms
3 Hz to ¾ Nyquist

Instantaneous Dynamic Range
(Normal Mode): 118 dB @ 4 ms
115 dB @ 2 ms
112 dB @ 1 ms
3 Hz to ¾ Nyquist (at all inclinations)

Technical specifications are typical values at 25°C
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TECHNICAL SPECIFICATIONS

Total System

Dynamic Range:

- 130 dB @ 4 ms
- 127 dB @ 2 ms
- 124 dB @ 1 ms
- 3 Hz to ¾ Nyquist (at all inclinations)

Frequency Response:

- Linear or minimum phase response
- -128 dB attenuation behind Nyquist
- Pass-band Ripple +/- 0.1 dB
  - 93.8 Hz @ 4 ms
  - 187.5 Hz @ 2 ms
  - 375 Hz @ 1 ms

Digital Low-Cut Filter:

- None or choice of 32 frequencies from
  - 3 to 90 Hz, 12 dB/octave

Digital Offset Filter:

- (i) Continuous Filter
  - 1.450 Hz @ 4 ms
  - 1.463 Hz @ 2 ms
  - 1.470 Hz @ 1 ms
  - 6 dB/octave
- (ii) Fixed DC Offset Removal

Total Harmonic Distortion: < 0.002%*

Sensor to Sensor Matching: +/- 0.4% (at all inclinations)

Cross Axis Isolation: - 46 dB

Sensor Module Interface: Proprietary 2-wire interface

Inclination Resolution: +/- 0.5° arc (relative to vertical)

PHYSICAL

Dimensions:

- Body: 16.87 cm x 5.49 cm diameter
- Top (ML21): 3.55 cm with an OD of 7.68 cm
- Top (MT21): 3.58 cm with an OD of 7.62 cm
- Weight: 0.771 kg, including 2 m cable and connector

ENVIRONMENTAL

- Operating Temperature: -40 °C to +75 °C
- Humidity: 0 to 100%
- Operating Altitude: -100 m to +5500 m
- Water Depth Rating: 15 m

*Measurement limited by mechanical test apparatus. Technical specifications are typical values at 25°C
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RELATED PRODUCTS

Alignment Tool:  For aligning all VectorSeis receivers along survey specific azimuth during deployment

Extraction Tool:  For extracting VectorSeis receivers from the ground

TESTING

Embedded Power-up Self Test:  Sensor wake-up and self configuration checks
Control loop validation

Operator Controlled System Tests:  Vertical orientation (evaluates each sensor axis gravity magnitude and vector sum of all 3 sensors)
Spread noise
Sensor loopback (verifies module telemetry and digital filter performance)
Telemetry error count

End of Record Validation Tests (Every Record):  Overscale status
Vertical orientation (used to apply orientation correction)
Sensor orientation deviation (evaluates orientation after each acquisition)
Sensor offset
Digital fault flags
RESPONSE CURVES

2 ms Magnitude Response

Magnitude, dB

Frequency, Hz

Linear Phase Alias
Minimum Phase Alias

2 ms Phase Response

Phase, Degrees

Frequency, Hz

Linear Phase Alias
Minimum Phase Alias

2 ms Impulse Responses

Linear Phase Alias
Minimum Phase