VectorSeis® digital sensors

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/s^2 (at all inclinations)

(Strong Motion Mode): +/- 13.1m/s^2 (source radius enabled with compatible systems; at all inclinations including gravity and offset)

Noise (Normal Mode): 0.4 $\mu m/s^2/\sqrt{Hz}$
3 Hz to 375 Hz

Equivalent Input Noise (EIN)
(Normal Mode): 4.18 $\mu m/s^2$ @ 4 ms
5.95 $\mu m/s^2$ @ 2 ms
8.46 $\mu m/s^2$ @ 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

VECTORSEIS

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VECTORSEIS ML21/MT21

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

VECTORSEIS ML21/MT21

RELATED PRODUCTS

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

Extraction Tool: For extracting VectorSeis receivers from the ground

ML21 ALIGNMENT TOOL

ML21 EXTRACTION TOOL

MT21 ALIGNMENT TOOL

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

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RESPONSE CURVES