

VSI Versatile Seismic Imager

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The VSI* Versatile Seismic Imager uses Q-Technology* three-axis single-sensor seismic hardware and software and advanced wireline telemetry for efficient data delivery from the borehole to the surface. Each sensor package delivers high-fidelity wavefields through the use of three-axis geophone accelerometers, which are acoustically isolated from the main body of the tool. The number of sensors, intersensor spacing, connection type (either stiff or flexible), and tool diameter are field configurable to ensure the maximum versatility of the array.

The VSI design focus on data fidelity and quick adaptation to changing survey needs avoids the compromise in data quality that typically results from efficiency limitations. The result is sharper, more accurate images and reduced operating logistics, which are fundamental elements for achieving complex surveys in a cost-effective manner and with timely delivery of answer products.

The operating efficiency of the VSI tool is enhanced by

- rapid mechanical deployment
- very little time between stations
- short shot-cycle time during remote source surveys (walkaway, offset vertical seismic profile [VSP])
- real-time quality control and data processing.

Applications

- Integrated processing for interpretation of borehole and surface seismic data
- Images for reservoir definition
- Images ahead of the bit
- Three-dimensional (3D) VSPs
- Pore pressure predictions
- Planning for well placement
- Simultaneous surface and borehole seismic recording for high-definition images
- Shear wave processing and analysis
- HFM* Hydraulic Fracture Monitoring for microseismic monitoring during hydraulic fracturing

Measurement Specifications

	VSI Tool
Output	Seismic waveform produced by acoustic reflections from bed boundaries
Logging speed	Stationary Seismic waveform recording: 1-, 2-, or 4-ms output sampling rate
Array capability	Up to 20 shuttles
Sensor package	
Length	11.4 in. [28.96 cm]
Weight	6.4 lbm [2.9 kg]
Sensor	Geophone Accelerometer (GAC-D)
Sensitivity	>0.5 V/g \pm 5%
Sensor natural frequency	25 Hz Flat bandwidth in acceleration: 2 to 200 Hz
Dynamic range	>105 dB at 36 dB gain
Distortion	<-90 dB
Digitization	24-bit analog-to-digital converter
Combinability	Bottom-only combinable
Special applications	Conveyance on wireline, TLC* Tough Logging Conditions system, tractor, or through drillpipe

Mechanical Specifications

	VSI Tool
Temperature rating	350°F [177°C]
Pressure rating	Standard: 20,000 psi [138 MPa] High pressure: 25,000 psi [172 MPa]
Borehole size—min.	3 in. [7.62 cm]
Borehole size—max.	22 in. [55.88 cm]
Outer diameter	Standard: 3.375 in. [8.57 cm] Slim: 2.5 in. [6.35 cm]
Length	Up to 1,040 ft [317 m] for 20 shuttles
Weight	Up to 2,200 lbm [998 kg]
Tension	18,000 lbf [80,070 N]
Compression	Standard: 5,000 lbf [22,240 N] With stiffener: 10,000 lbf [44,480 N]
Coupling	
Anchoring force	246 lbf [1,170 N] in 3-in. [7.62-cm] hole 214 lbf [915 N] in 6-in. [15.24-cm] hole 255 lbf [1,130 N] in 12¼-in. [31.75-cm] hole 160 lbf [951 N] in 17-in. [43.18-cm] hole
Sensor package coupling force	64 lbf [285 N]
Coupling force/sensor weight ratio	10:1

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