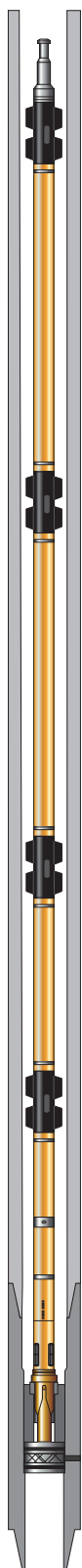


Tensor Elite MWD System



The Tensor Elite MWD system's proven design is compatible with collar diameters from 3 ½ in. to 9 ½ in. and operates at flow rates from 75 to 1,200 gpm. Industry leading sensors and electronics, coupled with a trusted mechanical architecture create an MWD system which delivers exceptional accuracy and reliability while minimizing the total cost of ownership.

The Black Diamond commitment to customer success is demonstrated by an exemplary support network encompassing market leading repair services, comprehensive training (both e-learning and hands-on), localized support teams, and a dedicated website delivering best in class support materials.

Features and Benefits

Reliable

Drawing on an established reputation in the industry, Tensor Elite provides high quality, reliable downhole systems for directional surveying and formation logging. The Black Diamond quality processes ensure products are manufactured and maintained to a uniform high standard.

Cost Efficient

The system operates in standard non-magnetic drill collars. The positive pulser can be routinely serviced in less than one day enabling quick turnaround of equipment. Extended battery life is achieved through energy efficient hardware and intelligent power management software.

Configurable

A choice of solenoid positive pulser or motor driven pulser allows the customer to select the most appropriate for their application.

Additional modules for gamma and Centerfire resistivity are available to enable expansion of services into the LWD market.

Modular

Flexible module configuration enables alternative sensor positions. Modules are interchangeable between collar sizes for flexibility of use. Short, lightweight modules allow cost-effective logistics, assembly and maintenance turnaround.

Retrievable and Reseatable

The Tensor MWD probe can be retrieved and reseated. In the event that the pipe becomes stuck in a hole, the MWD probe can be "fished" reducing the risk of loss. This capability also enables efficient probe upgrade and battery replacement if operations require.

High Temperature as Standard

The Tensor system is recognized as the system of choice for hot hole applications, with both 175 °C (347 °F) and 185°C (365 °F) operating temperature options available.

Optimized Telemetry

Downlink capability allows the operator to select the optimum transmission sequence and data resolution for each application with minimal impact on rig operations.

Tensor MWD System - Specifications

Technical Specifications

Collar O.D.	3.5 in.	4.75 in.	6.75 in.	8.25 in.	9.5 in.
Tool Connections	2 7/8 in. I.F.	NC 38	NC 50	6 5/8 in. REG	7 5/8 in. REG
Equivalent Collar Stiffness (OD x ID)	2.96 in. x 2.25 in.	4.75 in. x 2.81 in.	6.71 in. x 3.25 in.	7.93 in. x 4.00 in.	9.42 in. x 4.00 in.
Make-up Torque	3,500 lbf-ft	9,600 lbf-ft	30,000 lbf-ft	54,000 lbf-ft	62,000 lbf-ft
Flow Rate Range	75 - 165 usgpm	100 - 300 usgpm	150 - 800 usgpm	400 - 1,200 usgpm	400 - 1,200 usgpm
Max. Dogleg Rotation	50°/100 ft	15°/100 ft	10°/100 ft	8°/100 ft	4°/100 ft
Max. Dogleg Sliding	100°/100 ft	30°/100 ft	21°/100 ft	14°/100 ft	7°/100 ft
Probe OD	1.875 in.	Max. Pressure	20,000 psi	Max. Mud Weight	18 ppg
Max. Temperature Operating	347 °F / 365 °F	Max. Sand	1.0 % at maximum fluid velocity		
Max. LCM Tolerance	40 ppb any type, thoroughly and evenly mixed, with use of surface drill pipe screens				

Sensor Specifications

Directional	Tri-axial fluxgate magnetometers and Q-flex accelerometers		Gamma	NaI Scintillation
Measurement	Range	Accuracy	Parameter	Specification
Inclination	0 - 180°	+/- 0.1°	Memory Update	7.2 samples/ ft at 50 ft/hr
Azimuth	0 - 360°	+/- 0.25°	Real Time Update	3.6 samples/ ft at 50 ft/hr rotating 2.4 samples/ ft at 50 ft/hr sliding
Toolface - Magnetic	0 - 360°	+/- 0.5°	Resolution	1 API
Toolface - Gravity	0 - 360°	+/- 0.5°	Sensitivity	2.5 counts per API
TMF	0 - 100 µT	+/- 0.075 µT	Memory	32 Mb.
Dip	-90 - 90°	+/- 0.15°	Sampling Period	Programmable 1-60 seconds
GT	0 - 2,000 g	+/- 0.001 g		
Temperature	-32 - 392 °F	+/- 1 °F		

Surface System Specifications

Surface System	Eclipse Touch
Pressure Transducer	4 - 20 mA, 0-5000 psi, Zone 1, intrinsically safe
Hook Load Sensor	4 - 20 mA, - 0 100 klb, Zone 1, intrinsically safe
Depth Encoder	Incremental, Two Channel in quadrature, Zone 1, intrinsically safe