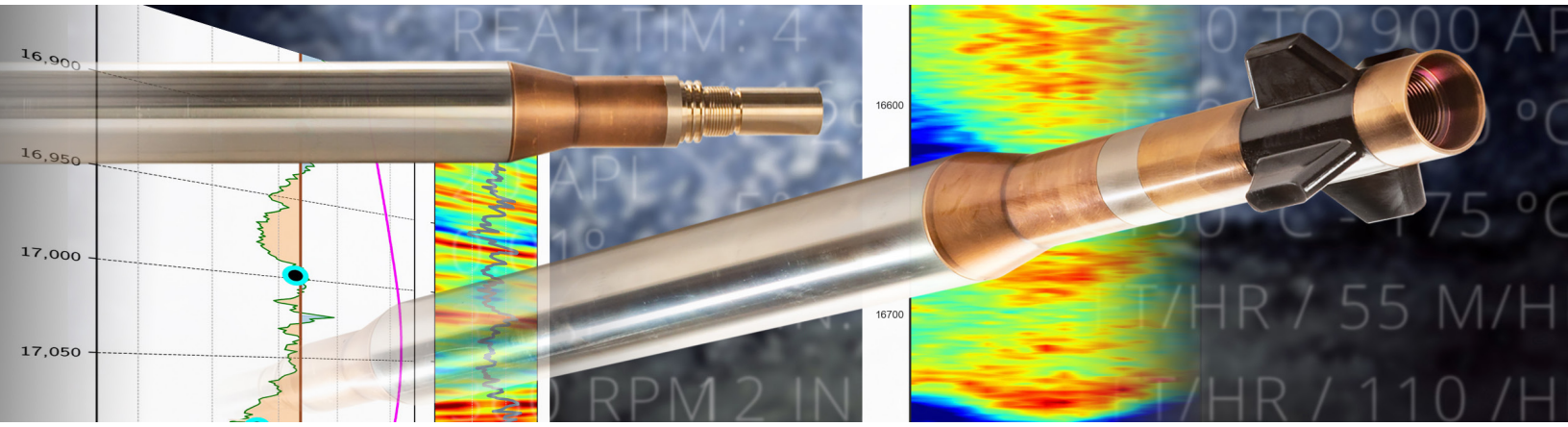
Perspective

Azimuthal Gamma Probe combines the best sensor technology with the latest in imaging software



High Resolution Bulk Gamma

High Resolution Stick-Slip Tolerant Azi-Gamma Imaging

Survey-Quality Continuous Inclination Measurement

Probe-Based Cost of Ownership

TENSOR
DRILLING TECHNOLOGIES

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Perspective Azimuthal Gamma Probe

The Tensor probe based system is fully compatible with Tensor MWD and Centerfire LWD and delivers:

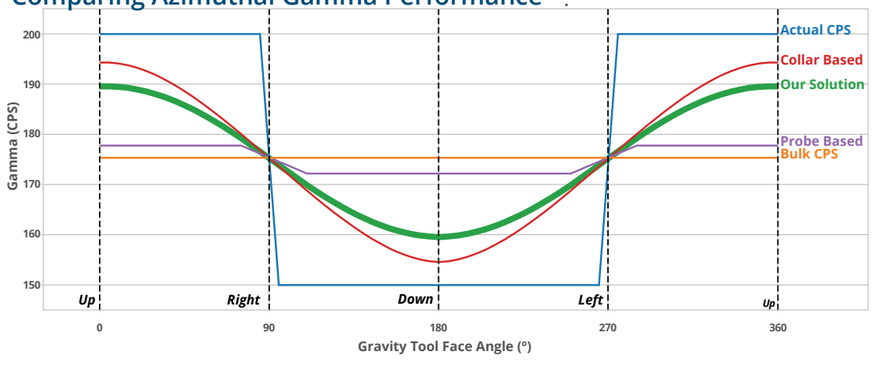
- High resolution Bulk Gamma
- High resolution, Stick-Slip tolerant Azi-Gamma imaging
- Survey quality Continuous Inclination measurement

The system has been designed to continue Tensor Drilling Technologies' vision of delivering low-cost, high reliability solutions that enable operators of all sizes to compete in lucrative, unconventional operations. The Probe based system allows entry into the lucrative geosteering market at a fraction of the price of collar based alternatives.

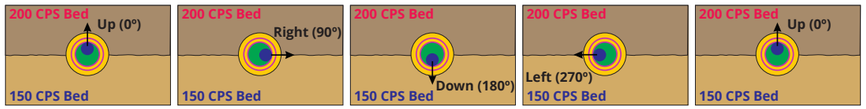
Designed for use in horizontal, extended reach and directional wells the system allows for optimal well placement, added confidence when drilling in dipping beds and the correct determination of geological stopping points.

Employing advanced mounting technology to protect the market leading electronics allows continuous operation in the harshest of drilling environments and at temperatures of 175 °C.

Comparing Azimuthal Gamma Performance



Tool Face Positions



Traditional probe based tools severely compromise resolution to deliver a pseudo azimuthal response. The market leading sensor technology employed in Perspective delivers resolution and accuracy directly comparable to collar based tools allowing the real application of geosteering and earlier, more reliable decisions to be made.

FEATURES

Azimuthal Gamma
The high resolution API Gamma Ray measurement drives effective well placement, assessment of formation inclination/ dipping beds, reservoir contact maximization and completions optimization. Azimuthal imaging enhances geosteering confidence and certain reaction to formation change.

Near Bit Continuous Inclination
Drawing on Tensor Drilling Technologies extensive sensor expertise the Near Bit Inclination measurement delivers market leading accuracy. Fully configurable transmission sequences allow this critical steering data set to drive accurate well placement.

Pressure Measurement
System measures annulus and bore pressure allowing calculation of Equivalent Circulating and Static Density.

Downhole RPM
System calculates maximum, minimum and average data being used to generate Stick Slip Index. High performance rotation evaluation enables the use of Dynamic Sequences with improved confidence.

High Temperature as Standard
Perspective is system of choice for hot hole applications, with 347 °F/ 175 °C operating temperature as a non-price premium standard.

Easily Serviceable
Service turnaround in less than a day drives effective fleet utilization and so maximizes return on investment.

Near Bit Continuous Inclination | High Resolution API Gamma Measurement

Perspective *combines the best sensor technology with the latest in imaging software to provide the best in class, cost-effective geosteering solution.*

Specifications

Natural Gamma Ray	
Measurement Range	0 to 900 API
Total GR Accuracy	2% (Range: 0 °C - 150 °C) 5% (Range: 150 °C - 175 °C)
Bed Resolution, Vertical Hole	6 in. @ 180 ft/hr | 55 m/hr 12 in. @ 360 ft/hr | 110 /hr

Azimuthal Gamma Ray	
Imaging Sectors	Real Tim: 4 Memory: 16
Bed Resolution, Lateral Hole	20 API
Resolution of Dip Angle	0.01°
Max. Stick-Slip Tolerance	3 SSI
Max. Rotary Speed	360 RPM
Max. Rate of Penetration (ROP)	360 ft/hr | 110 m/hr

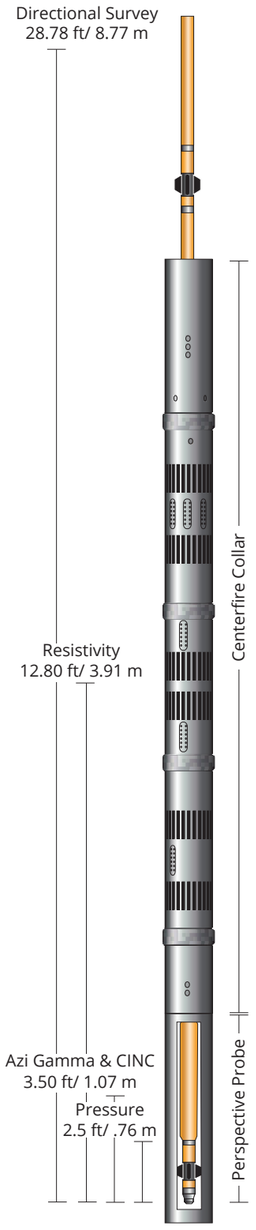
Continuous Inclination Sensor	
Range	0 to 180°
Resolution	0.05°
Accuracy	60 to 120° ± 0.10° 30 to 60° ± 0.15° 10 to 30° ± 0.30°

Pressure	
Operating Range	25 kpsi | 172.5 MPa
Accuracy	.15% FS to 1.45 kpsi to 16 kpsi
	.5% FS to 16 kpsi to 25 kpsi

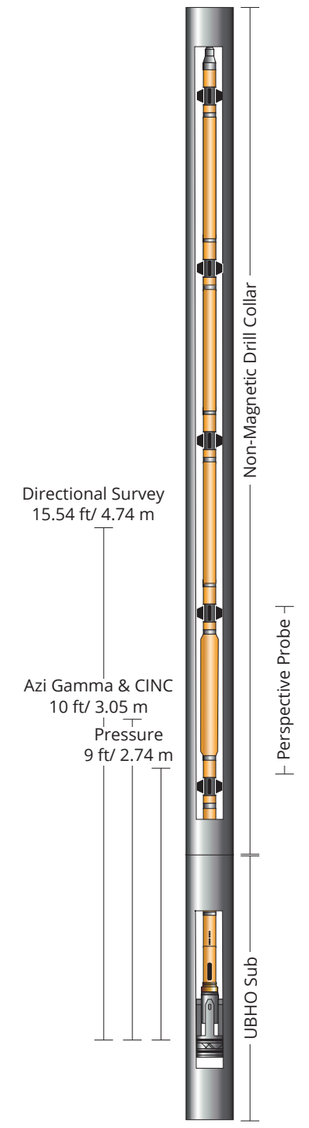
Mechanical		
Max. Operating Temperature		347 °F/ 175 °C
Max. Operating Pressure		20 kpsi | 137.9 MPa
Flow Rate Range	4.75 in/ 120 mm	375 usgpm | 1420 lpm
	6.75 in/ 172 mm	750 usgpm | 2840 lpm
	8.25 in / 209 mm	1200 usgpm | 4542 lpm
Bore ID	4.75 in/ 120 mm	3.25 in | 82.55 mm
	6.75 in/ 172 mm	3.75 in | 95.25 mm
	8.25 in / 209 mm	4.00 in | 101.6 mm
Max. Sand Content		2%
Max. Shock		500 g, 0.5 ms pulse width
Max. Vibration		20 grms, 5-500 Hz

Electrical	
Voltage Operating Range	17 to 36 VDC
Max. Current	35 mA @ 175 °C
Max. Logging Memory	500 hrs

Centerfire LWD Configuration



Tensor MWD Configuration



Tensor's Azimuthal Gamma Probe

Perspective

Elevating the MWD/LWD Platform

2418 North Frazier St. | Suite 100
Conroe, Texas USA 77303
P: +1 346.353.5130

www.Tensordt.com