



At-Bit Measurement System-4 3/4 in.

Weatherford's at-bit measurement (ABM) system provides real-time, on-the-fly inclination and azimuthal gamma ray (GR) measurements only inches from the bit. Unlike traditional motor telemetry systems, the ABM system provides rapid data transfer between the sensors (located below the motor) and the MWD via the hard-wired mud motor. When used together, the inclination and GR measurements enable faster decision-making, excellent geosteering, and the ability to drill a flat trajectory, resulting in

fewer wellbore sidetracks and increased hydrocarbon recovery.

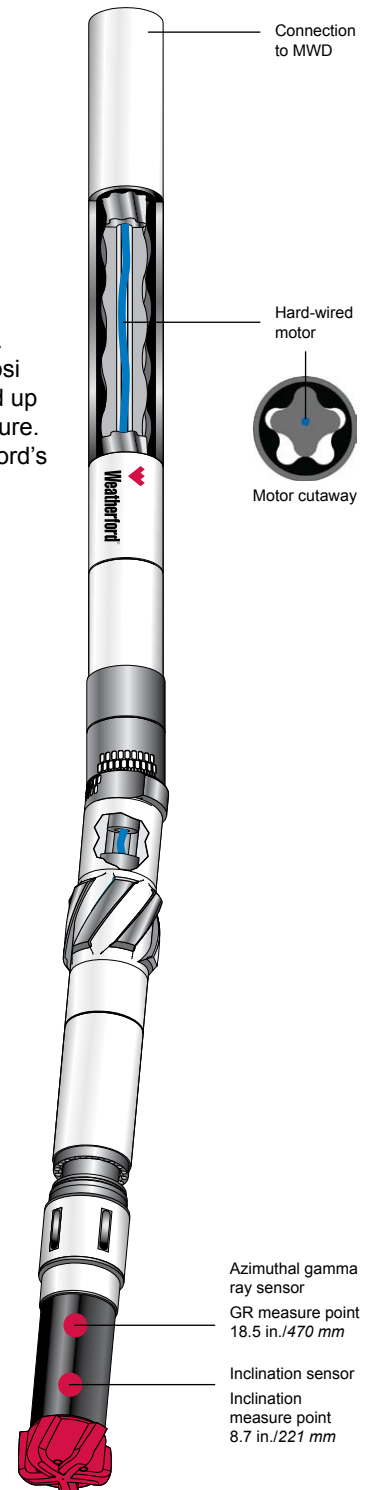
The GR sensor uses scintillation technology to provide the industry's only below-the-motor azimuthal GR measurement with real-time imaging. This MWD system is rated to 5,000 psi (34,473 KPa) operating pressure and up to 302°F (150°C) operating temperature. The tool is compatible with Weatherford's EMPulse™ MWD system.

Applications

- Geosteering in horizontal wellbores
- Underbalanced drilling
- Steam-assisted gravity drainage (SAGD)
- Improved wellbore placement through the use of real-time GR imaging
- Improved reservoir recovery by drilling flatter trajectories

Features, Advantages and Benefits

- Scintillation technology provides a real-time GR image only inches from the bit. GR orientation can be provided when in either rotation or sliding.
- Real-time, at-bit inclination, and GR measurements increase geological reaction time, resulting in more reliable wellbore placement during geosteering.
- Since information is stored in non-volatile memory to insure reliable data retrieval, data can be retrieved either from the EDP port location on the sensor or via the MWD system memory, saving valuable rig time.
- The ABM system enables more accurate wellbore separation in SAGD wells, resulting in the formation of more effective steam chambers for optimal drainage and production.
- The combination of inclination and GR at the bit can result in fewer wellbore sidetracks and increased hydrocarbon recovery.
- The ABM system operates on lithium battery power to insure uninterrupted operation, enabling communications when mud is not flowing through the bottomhole assembly.
- Less overall time is spent sliding when using the ABM, increasing overall well ROP.





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Specifications

Collar Description	
Collar length	39 in. 99 mm
Collar OD-nominal	4.75 in. 121 mm
Collar OD-maximum	5.43 in. 138 mm
Collar material	P550
Insert material	INCONEL® 718
Top collar connection	3 1/2-in. IF box
Bottom collar connection	3 1/2-in. IF box
Operating Parameters	
Temperature	302°F 150°C
Pressure	5,000 psi 34,473 KPa
Flow rate	350 gpm 1,325 lpm
Bending strength ratio	2:10
Tension (maximum)	750,000 lbf 3,336 kN
Sand content (maximum)	2%
Dogleg °/100ft	
Rotating	20°
Sliding	36°

Inclination		
Sensor type	1-axis inclinometer	
Full Scale		
Measurement range	0 to 128°	
Measurement accuracy	Static	
	Incline	Accuracy
	0 to 2.5°	± 2.0°
	2.5 to 5.0°	± 1.5°
	5.0 to 20.0°	± 0.75°
	>20.0°	± 0.25°
Measurement point	8.7 in. 221 mm	

Gamma Ray	
Sensor type	Scintillation
Measurement range	0 to 250 API
Measurement accuracy	5% at 100 API
Measurement point	18.5 in. 470 mm

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