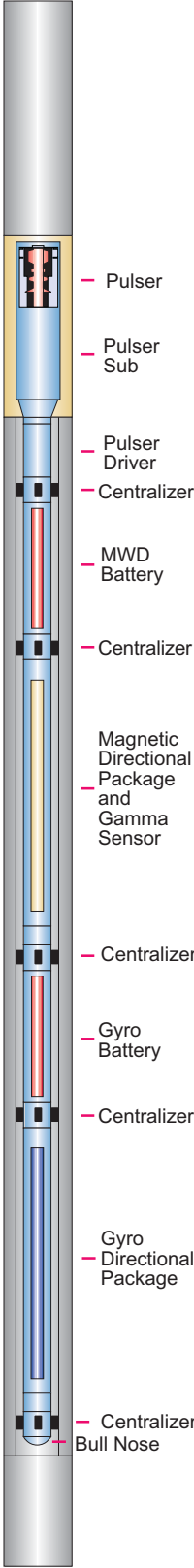


Gyro Measurement-While-Drilling (gMWD)



Powerful KEEPER Gyro/MWD Surveys

Scientific Drilling's Gyro Measure-While-Drilling (gMWD) makes simultaneous use of our high-accuracy KEEPER Gyro System coupled with our Mud Pulse MWD. This powerful combination facilitates fast top-hole drilling operations in a multi-well environment.

Symbiotic Gyro/Magnetic Surveys

gMWD's synergy between gyro and magnetic orientations produces the maximum survey accuracy and speed. gMWD uses initial gyro orientations and surveys for kickoff. When the magnetic influence depth has been reached (using cross comparison between magnetic and gyro surveys), the gyro section is shut down and the hole section is completed using the MWD magnetic readings.

gMWD Reaches New Performance Heights

Scientific Drilling's reputation for engineering excellence is defined by our commitment to continuous product improvement. Having drilled more than 1.8 Million Feet of hole, the gMWD sets the standard for high performance and ruggedness. gMWD is optimized for multi-well tophole and reentry/sidetrack applications. gMWD's many capabilities include:

- Robust communications and power management
- Ruggedized sensor vibration and shock handling
- Fast sensor shutdown and reinitialization resulting in rapid cross correlations between gyro and magnetic sensors
- High-speed toolface

Technical Specifications		
Collar sizes:	3.125" (7.9cm) 3.5" (8.9cm) 4.75" (12.1cm) 6.25" (15.87cm)	6.50" (16.5cm) 6.75" (17.15cm) 8" (20.3cm) 9.5" (24.1cm)
Dog Leg	Sliding: 12 (8") 20 (6.75") 28 (4.75") 60 (3.5") 65 (3.125")	Rotating: 7 (8") 10 (6.75") 12 (4.75") 20 (3.5") 20 (3.125")
Temperature:	MWD: 302°F (150°C) Gyro: 302° F (150°C)	
Pressure:	20,000 psi (137,900 kPa)	
Lost Circulation:	Medium nut plug 40 lbs/bbl	
Sensor Accuracy:	Subject to well profile	
Maximum Pressure:	MWD < 100 psi @ 1,500 gal/min Gyro < 75 psi @ 1,500 gal/min	
Toolface Update Rate:	8 - 14 seconds	
Length:	30 ft (9.14m)	
Flow Rate:	Pulser Sub O.D.	Max. Flow Rate
	3.125" - 3.5"	200 gal/min
	4.75" - 6.5"	400 gal/min
	6.5"	600 gal/min
	6.75" - 8"	1,000 gal/min
9.5"	1,500 gal/min	

ADVANTAGES

- **Multi-Mode Surveys.** Gyro and/or magnetic surveys and orientations.
- **Faster Survey Times.** Maximum pumps off is 3.5 minutes to record survey.
- **Closer to Bit Surveys.** X and Z gyros are 15 feet closer to the bit than standard MWD magnetic sensors.
- **Multi-Mode Toolfaces.** Gyro or magnetic toolfaces then highside toolfaces at user-defined inclination threshold.
- **Positive Telemetry.** Positive pulse system.
- **Standardized Gamma Ray (GR).** Scintillation/ AAPI GR
- **Multi-Mode Transmission Trigger.** Vibration or rotation "On/Off" or pumps "On/Off."
- **Controlled Vibration and Shock.** Peak and RMS vibration (Gs).

