COLT Directional Services ®

ENOX MWD Technology ®

Solving today's MWD reliability challenges

ENOX MWD Engineering provides every advanced technology required to meet all drilling conditions. ENOX is a dedicated design built to internally protect itself while providing accurate measurement while drilling data. Our ENOX design was carefully built and qualified by the industry's leading engineering groups. When using COLT Directional Services we keep you on target and prevent unwanted down time.

System

The ENOX ® MWD Pulse technology represents a cutting-edge probe-style positive pulse MWD system that incorporates advanced technology and design methods. Its streamlined single-probe design reduces the number of tools required per job and facilitates on-site configuration adjustments and maintenance.

Features

The system utilizes the latest technology to reduce circuit board count and eliminate connectors. Proprietary electronics mounting inside the modules and internal compression mounting inside the barrel reduces shock and vibration exposure.

Measurements

- Standard Survey
- 6 Axis Vector Survey
- Gravity and Magnetic toolface
- Axial and Lateral S&V – Peak, RMS, Average
- Continuous Inclination
- Continuous Azimuth
- API Gamma Ray
- All measurements stored in memory at high resolution

Applications

ENOX® MWD Pulse technology can be run in a variety of modes to address the needs of the operation:

- Full directional mode behind a steerable motor with onsite personnel.
- Full directional mode behind a steerable motor operated from the Rigline 24/7 remote operations center.
- Unmanned survey in straight hole applications where directional needs are minimal.
- Unmanned gamma logging for picking formation tops or logging to kick off point.™

Smart Telemetry

ENOX® MWD Pulse technology incorporates a telemetry switching scheme to maximize bandwidth use during rotating and sliding operations. This eliminates toolfaces while rotating when they are not needed to maximize log quality without sacrificing steerability while sliding.

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GENERAL TOOL SPECIFICATIONS

MWD Tool Size O.D.	in	1-7/8"

SURFACE EQUIPMENT & MWD CAPABILITIES

	YES/NO	YES	YES	YES
	YES/NO	YES	YES	YES
TOOH	YES/NO	YES	YES	YES

OPERATING SPECIFICATIONS AND LIMITS

Flow Range	GPM	150 - 400	300 - 1,000	300 - 1,250
Maximum WOB	lb	80,000	136,000	252,000
Maximum Drilling Torque	ft-lbs	API Connection Limited	API Connection Limited	API Connection Limited
Maximum Make Up Torque	ft-lbs	22,000	27,800	59,800
Maximum Overpull	lb	755k	1160k	1700k
DLS with Slick-Collar	°/100 ft	API Connection Limited	API Connection Limited	API Connection Limited
DLS with Flexible-Collar	°/100 ft	API Connection Limited	API Connection Limited	API Connection Limited
Maximum Tool Rotation	RPM	Mud Motor Limited	Mud Motor Limited	Mud Motor Limited
Maximum Operating Temperature	°F	356	356	356
Maximum Operating Pressure	psi	20,000	20,000	20,000
Maximum Shock, Axial/Lateral Vibrations		20g rms random 15 - 500Hz	20g rms random 15 - 500Hz	20g rms random 15 -500Hz
Maximum Sand Content	% vol	<1%	<1%	<1%

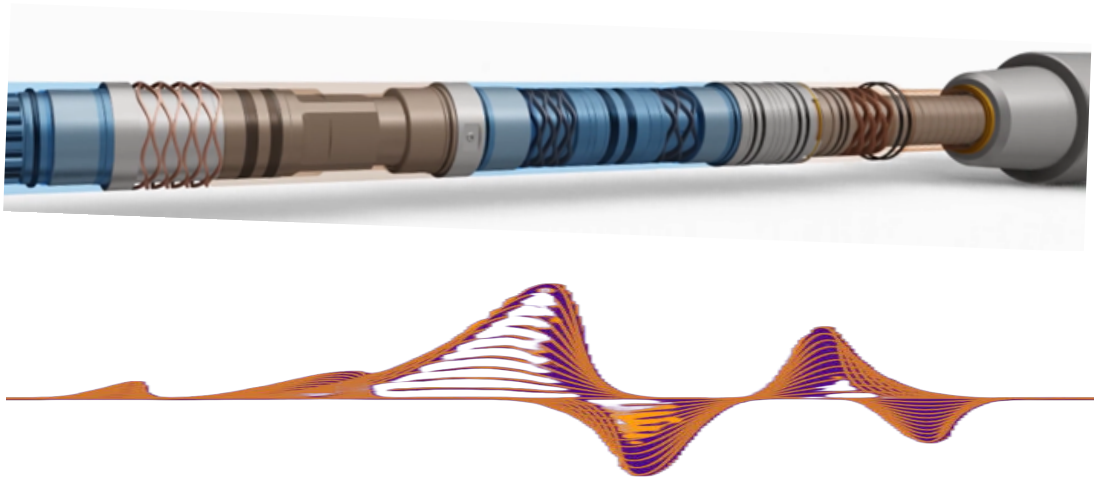
DIRECTIONAL SENSOR

Continuous Inclination	Accuracy (°) ±	0.1 @ 15° INC	0.1 @ 15° INC	0.1 @ 15° INC
Continous Azimuth	Accuracy (°) ±	3° 0-360	3° 0-360	3° 0-360
Inclination	Accuracy (°) ±	± 0.1	± 0.1	± 0.1
Azimuth	Accuracy (°) ±	± 0.5	± 0.5	± 0.5
Gamma Ray Accuracy	±%	± 2% count rate change 77F to 302F ± 5% count rate change 302F to 356F	± 2% count rate change 77F to 302F ± 5% count rate change 302F to 356F	± 2% count rate change 77F to 302F ± 5% count rate change 302F to 356F

NEW SHOCK SHIELD TECHNOLOGY

All ENOX equipment was designed and manufactured in The United States of America. Every aspect of the equipment is controlled by COLT Directional Services and maintained by our ENOX MWD Engineering Team. The ENOX MWD Lab is 100% focused on maintaining the ENOX MWD System to the highest standards.

Shock Shield Technology



SHOCK SHIELD effectively reduces destructive harmonics in the BHA.

SHOCK SHIELD replaces UBHO/ Muleshoe Sub. Easily married with and tuned to drill string shock devices.

Features

- Available in 4-3/4", 6-1/2", 6-3/4" and 7.0" sizes
- 3-1/2" and 4-1/2" API IF box connections
- Customized crossover sub connections
- Great flexibility to meet variable needs:
  - Configure with Z-axis shock and vibration decoupling
  - SHOCK SHIELD stick slip combined with Z-axis decoupler
  - Stick slip C-axis element run within the UBHO Sub
- Easy and cost-effective maintenance
- The set screws of the UBHO has been relocated to allow muleshoe/tool string to be detached from the drill string.
- Cannot lose orientation

Benefits/Highlights

- Reduces shock and vibration
- Increases ROP
- Reduces NPT and increases MTBF
- Reduces wear and tear on the MWD
- Enhances toolface control
- Improves the reliability and performance of MWD

Examples of Previous Job Performances

- **Northern Oklahoma, Curve**: Peak shocks reduced by 75% and vibration reduced by 53%.
- **Bakken, Lateral:** No more MWD failures after adding 4-3/4" Shock Shield
- **New Mexico, Curve & Lateral:** Axial shock reduced by 60% on average and ROP increased by over 30%

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