

# EnSight MWD™

## EM RETRIEVABLE ELECTRO-TRAC SYSTEM

### DESCRIPTION

The EnSight MWD™ EM Retrievable Electro-Trac System combines Sharewell's patented state-of-the-art EM technology with GE's industry standard Tensor downhole sensors to provide an accurate, reliable and cost effective EM MWD solution. The Electro-Trac Data Fusion surface receiver is based on a completely new and revolutionary approach to EM telemetry signal processing improving noise immunity and extending both the transmitted data rate and operating range of EM MWD.

### CONFIGURATION

EnSight MWD™ EM Retrievable Electro-Trac System is based on the GE Tensor retrievable MWD architecture enabling customers to utilize standard BHA components and common Tensor parts across their tool fleet. Apart from the downhole probe, a Gap Sub is the only non-standard BHA component required. The Surface System provides bidirectional EM communication to ensure optimal data transmission to TD.

### APPLICATIONS

#### Conventional drilling

- Pad drilling: vertical, directional and horizontal drilling

#### Underbalanced drilling

- Aerated muds, foam, mist and air applications

#### Risk Mitigation

- Lost circulation zones/high LCM applications

#### Unconventional drilling

- Coal bed methane/coal seam gas
- Mining/degasification

### FEATURES & BENEFITS vs. Mud Pulse Telemetry

#### Reduced NPT risk

- No moving parts: less wear and tear, easier maintenance
- LCM tolerant: no plugged pulsers or LCM limitations

#### Improved drilling efficiency

- Data without fluid circulation: surveys during connection
- Up to 12 bps: less hidden NPT orienting mud motor
- Less pressure drop: increased flow for improved hole cleaning

#### Extended applications

- Independent of drilling fluid properties: operates in air, mist, foam and underbalanced applications
- Independent of flow rate: improved performance for unconsolidated kick-offs & through lost circulation zones

### FEATURES & BENEFITS vs. other EM MWD

#### Efficient equipment rig up

- Single lift to load pre-assembled probe into standard collar

#### Reduced LIH risk & NPT exposure

- Retrievable probe, standard BHA components
- Can replace Electro-Trac with Tensor MWD without tripping

#### Extended longevity

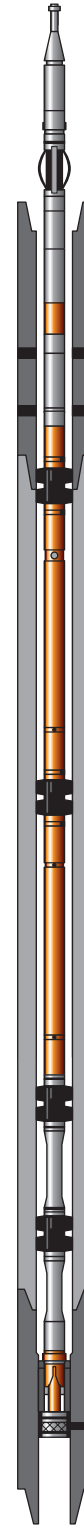
- Up to 200 hrs. on a single battery with typical field settings
- Proprietary Gap Sub ceramic coating techniques and sealants

#### Extended operating envelope

- Patented Data Fusion processing of multiple signal inputs
- Delivers up to 13,000 ft. TVD range and up to 12 bps
- Less geological limitations than other systems due to ability to decode highly attenuated signals.

#### Tensor compatible

- Reduced equipment costs, fleet use of compatible sensors, spares and other components result in improved equipment utilization and reduced inventory costs



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## GAP SUB SPECIFICATIONS

Collar O.D. (in)	4 ¾"	6 ½" - 6 ¾"	7 ¾"
Collar I.D. (in)	2 ½" - 2 11/16"	2 11/16" - 3 ¼"	3 ¼"
Gap Sub length (ft) (shoulder to shoulder)*	54"	56"	52"
Tool connections	3 ½" If Box x Pin	4 ½" If Box x Pin	Reg Box x Pin
Maximum drilling torque (ft-lbs)	8,000	24,000	42,000
Maximum dogleg severity	Sliding (deg/100)	25	18
	Rotating (deg/100)	15	10
Maximum pressure drop (psi)	100	100	100

## PROBE SPECIFICATIONS

Probe size O.D.	1.875"		
Probe length (ft.)	25.5 ft and 26.9 ft with Gamma (minimum-adjusted to monel length)		
Pressure rating	20,000 psi		
Operating temperature	0°C to 150°C		
Survival temperature	-40°C to 150°C		
Sand content	0.25% or trace as measured at suction		
Minimum flow rate (air drilling)	Recommend 40 gpm fluid		
Maximum flow rate (gpm) - dependent on drill collar ID Not recommended to exceed 40 ft/s Maximum for typical range of collar ID's	250-300	450-800	1,200
Battery	Hermetically-sealed Lithium Thionyl Chloride cells & batteries		
Battery life	Up to 200 operating under typical operating conditions (6 bps & 50% power)		

## SURFACE SYSTEM SPECIFICATIONS

Rig floor display & rig floor sensors	ATEX Zone 1 CE certified		
Surface system	110v UL & CE1 certified		
Downlink power amplifier - max. power	200W, UL & CE1 certified		

## SYSTEM SPECIFICATIONS

Transmitted data rates (bits per second)	0 to 42		
Update rates (seconds)	Toolface	8 to 12 seconds 4 parameters, user selectable)	
	Survey (standard)**	20 to 30 seconds (8 parameters, user selectable)	
Downlinking	Yes, By EM Transmission to Electro-Trac tool - User selectable operating frequency (Hz)		
Transmitted parameters	Steering	Field programmable	
	Survey	Field programmable	
	Query	Asynchronous query via EM downlink	

## OPERATING LIMITS

Shock	Operating	1,000g, 0.05 ms ½, sine	
	Survival	2,000g, 0.05 ms ½, sine	
Vibration	Operating	15g peak (50 to 800 Hz sine) - 10 gms (random max.)	
	Survival	30g peak (50 to 800 Hz sine) - 20 gms (random max.)	

## SENSOR SPECIFICATION

Directional sensor package	Tri-axial fluxgate magnetometers and Q-Flex accelerometer package		
Directional measurement	Range	Resolution	Accuracy
Inclination	0-180°	0.1°	±0.1°
Azimuth	0-360°	0.1°	±0.25°
Tool face	0-360°	10°	±0.5°
Total Magnetic Field (TMF)	0-70µT	0.137µT	0.003µT
Dip	-90 - 90°	0.1°	±0.15
GT	0 - 1,000	0.0001g	
Total Gravity Field (GT)	0- 2.000g	0.001g	±0.001g
Temperature sensor	-32°-302°	0.1°F	±2F
Gamma sensor package	Sodium Iodide Scintillator Crystal		
Gamma measurement	Sensitivity	Resolution	Accuracy
	1.7 Cts/API	6.8"	±5%