

PRODUCT SPEC SHEET

HALO Rotary Steerable System

The HALO High Build Rate Rotary Steerable System is the ultimate directional drilling solution for oil & gas resources development projects. The HALO's High build rate and advanced steering control capabilities consistently deliver wells with challenging profiles ahead of budget and schedule. With integrated ECD monitoring and geo-steering technologies, HALO mitigates drilling risks and places wellbores with exceptional precision.

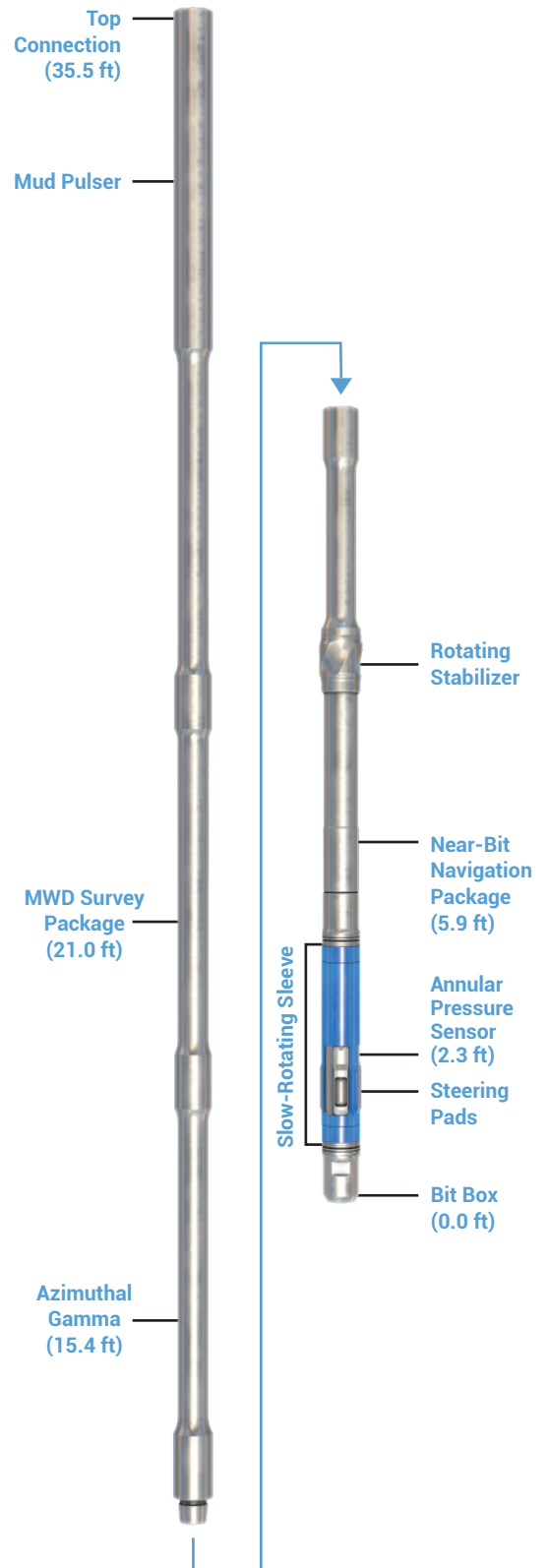
By tailoring the HALO as a fit-for-purpose rotary steerable system, Scientific Drilling strives to overcome the ever-intensifying economic and technical challenges of the modern drilling world. With an intense focus on maximizing drilling performance, service quality, and reliability, HALO is the premier High Build Rate Rotary Steerable System.

DELIVERING THE ULTIMATE VALUE

- Capable of drilling curve section with up to 15°/100 ft build rate, maximizing wellbore exposure in the target zone
- Autonomous steering functionality delivers superior directional results consistently regardless of well depth, extending total well length potential
- HALO's high-accuracy near-bit navigation package continuously provides immediate feedback to the down-hole control system, ensuring precise wellbore placement
- HALO can run in conjunction with high performance mud motors with maximum bit-speed up to 350 RPM, (highest in the industry); maximizing penetration rate and drilling efficiency
- Versatile steering capability enables complex well profiles to be drilled in one run without the need to trip for BHA change
- Delivers smooth and in-gage wellbore with minimum tortuosity
- Maximizes hole-cleaning efficiency with drilling string in continuous rotary mode
- Early detection and prevention of drilling problems via continuous Equivalent Circulating Density (ECD) monitoring
- Real-time azimuthal gamma data enables geo-steering and prevents unintended bed boundary exit
- Downlink commands can be transmitted while drilling and while pulsing MWD data to surface without requiring additional rig equipment, saving valuable rig time and cost
- HALO systems arrive at the rig site fully assembled, ready to be picked up and run in hole, saving valuable rig time and mitigating HSE risk associated with BHA handling

TARGET APPLICATIONS

- Unconventional shale wells
 - Long horizontal sections
 - High build rate curve sections
 - Extended reach
 - 3D-profile
- Geo-steering
- Performance drilling



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GENERAL SPECIFICATIONS

Tool Size	6 1/2 in (nominal)
Hole Size	7 7/8 in to 9 7/8 in
Maximum Steering Rate	15°/100 ft (12°/100 ft recommended for Well Planning)
BHA Length	35 ft
BHA Weight	2,822 lbs
Top Connection	NC 46 Box
Bottom Connection	4 1/2 in API Reg Box (7 7/8 - 8 3/4 in HS) 6 5/8 in API Reg Box (9 7/8 in HS)

OPERATING SPECIFICATIONS & LIMITS

Flow Range	300-700 gpm	
Maximum WOB	60,000 lbs	
Max. Drilling Torque	15,100 ft-lbs (at Bit)	
Max. Torque to Failure	29,800 ft-lbs (at Bit)	
Max. Pass-Through Dogleg	Rotating 15°/100 ft	Sliding 30°/100 ft
Max. Tool Rotation	350 rpm	
Max. LCM Tolerance	50 ppb Medium Fibrous	
Max. Operating Temperature	302°F (150°C)	
Max. Hydrostatic Pressure	20,000 psi	
Max. Sand Content	1% (recommended volume <0.5%)	

VIBRATION SPECIFICATIONS

Axial	4 g RMS for 3hr; 6 g RMS for 0.5hrs
Lateral	5 g RMS for 3hr; 7.5 g RMS for 0.5hrs
Stick Slip	150% for 5hr, 200% or neg. rpm detected for 0.5hr

MAGNETIC KICK OFF FROM VERTICAL

Sensor Type	Magnetometer
Continuous Rotating TF Accuracy	+/-5° @ 10° below DIP angle +/-10° @ 5°-10° below DIP angle

AZIMUTHAL GAMMA RAY

Sensor Type	Nal Scintillation Crystal
Range	0 – 1,000 API
Accuracy	+/- 5 API @ 100 API and 60 ft/hr
Azimuthal Measurement	4 sectors RT; 8 sectors Memory
Vertical Resolution	6 in.

ANNULAR PRESSURE

Sensor Type	Absolute Pressure Measurement
Range	0 – 20,000 psi
Accuracy	+/- 0.15%FS

DIRECTIONAL SURVEY

Sensor Type	Triaxial Accelerometer & Magnetometer
Inclination Range	0 – 180°
Azimuth Range	0 – 360°
Inclination Accuracy	+/- 0.15° at all angles
Azimuth Accuracy	+/-0.3° > 3°

DYNAMICS

Measurements	Axial Vibration, lateral Vibration, RPM, stick-slip severity
Vibration Range	0 – 25 g RMS; DC 0 – 120 Hz
RPM Range	0 – 1,000 rpm

NEAR BIT INCLINATION

Sensor Type	Accelerometers
Range	0-180°
Continuous Rotating Accuracy	0 – 90° +/- 0.3°
Static Accuracy	5 – 30° +/- 0.8° 30 – 90° +/- 0.5°

*Specifications are subject to change without notice