



Scientific Drilling International's HALO high-performance rotary steerable system solves reliability and economic challenges while yielding more efficient, smoother directional wellbores throughout North America. Designed to complete vertical, curve and lateral sections in a single run, it helps avoid costly trips and improves rate of penetration (ROP), in even the harshest environments.

The system maximizes wellbore exposure in the target zone by drilling curve sections with build rate up to 15°/100 ft, while its 3D advanced directional control system delivers unparalleled lateral placement. It can be paired with conventional mud motors and operates at a maximum bit speed, up to 350 RPM; thus, maximizing performance and reducing rig time.

Data is transmitted to surface from the system's high-speed mud pulse telemetry. The HALO system allows precise on-the-fly directional control without interrupting the drilling process.

Consisting of an integrated steering unit and MWD survey package, with azimuthal gamma ray geosteering and pressure-while-drilling capabilities, the HALO system is fully assembled and qualified prior to delivery to the rig site. This minimizes BHA assembly time and mitigates associated HSE risks.

For more information on improving your drilling efficiency [while staying on target] contact your Scientific Drilling sales representative or visit:

<http://scientificdrilling.com/halo-rss>

## APPLICATIONS

- + Performance drilling
- + Extended-reach wells

## BENEFITS

- + High RPM limit Improves drilling performance
- + Build rate capability (up to 15°/100 ft) maximizes reservoir exposure in the target zone
- + Enhances drilling efficiency due to superior automated lateral/3D advanced directional control functionality
- + Reduces handling risk and invisible time through an integrated system design

## FEATURES

- + Magnetic referenced kickoff from vertical
- + Compatible with Scientific Drilling's TiTAN22 high-performance mud motors, as well as third-party motors
- + Real-time azimuthal gamma ray measurements and near-bit navigation package provides continuous feedback
- + Real-time continuous equivalent circulating density (ECD) measurements enable continuous hole cleaning monitoring
- + Downlink commands can be transmitted during drilling, while pulsing MWD data to surface
- + Real-time vibration readings: lateral, axial and stick-slip

| GENERAL SPECIFICATIONS |   |
|------------------------|---|
| TOOL SIZE              | 6 1/2 in. (nominal)   |
| BOREHOLE SIZE          | 7 7/8 in. to 8 3/4 in.<br>(9 7/8 in. special configuration)                           |
| MAXIMUM STEERING RATE  | 15°/100 ft (12°/100 ft recommended for well planning)                                 |
| BHA LENGTH             | 35 ft, 6 in.  |
| BHA WEIGHT             | 2,822 lb  |
| TOP CONNECTION         | NC 50 Box or NC 46 Box  |
| BOTTOM CONNECTION      | 4 1/2 in. API Reg Box (7 7/8 to 8 3/4 in. HS)<br>6 5/8 in. API Reg Box (9 7/8 in. HS) |

| OPERATING SPECIFICATIONS & LIMITS |   |
|-----------------------------------|---|
| FLOW RANGE                        | 400 to 650 gpm                            |
| MAXIMUM WOB                       | 60,000 lb                                 |
| MAX DRILLING TORQUE               | 15,100 ft-lb (at bit)                     |
| MAX TORQUE TO FAILURE             | 29,800 ft-lb (at bit)                     |
| MAX PASS-THROUGH DOGLEG           | Rotating 15°/100 ft<br>Sliding 30°/100 ft |
| MAXIMUM TOOL ROTATION             | 350 rpm                                   |
| LCM                               | 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 DETECTED (0.5HR) | 150% for 5hr, 200% or neg. rpm        |

| MAGNETIC KICK OFF FROM VERTICAL |  |
|---------------------------------|--|
| SENSOR TYPE                     | Magnetometer   |
| CONTINUOUS ROTATING TF          | +/-5° @ 10° below DIP angle<br>+/-10° @ 5°-10° below DIP angle |

| AZIMUTHAL GAMMA RAY   |                                    |
|-----------------------|------------------------------------|
| SENSOR TYPE           | Nal scintillation crystal          |
| RANGE                 | 0 to 1,000 API                     |
| ACCURACY              | +/- 2.8 API @ 100 API and 60 ft/hr |
| AZIMUTHAL MEASUREMENT | 4 sectors RT; 8 sectors memory     |

| ANNULAR PRESSURE |                               |
|------------------|-------------------------------|
| SENSOR TYPE      | Absolute pressure measurement |
| RANGE            | +/- 0.15%FS                   |
| ACCURACY         | 0 to 20,000 psi               |

| DIRECTIONAL SURVEY   |                                       |
|----------------------|---------------------------------------|
| SENSOR TYPE          | Triaxial accelerometer & magnetometer |
| INCLINATION RANGE    | 0 to 180°                             |
| AZIMUTH RANGE        | 0 to 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 to 25 g RMS; DC 0 to 120 Hz                                |
| RPM RANGE       | 0 to 1,000 rpm   |

| NEAR-BIT INCLINATION         |  |
|------------------------------|--|
| SENSOR TYPE                  | Accelerometers                         |
| RANGE                        | 0 to 180°                              |
| CONTINUOUS ROTATING ACCURACY | 0 to 90° +/- 0.3°                      |
| STATIC ACCURACY              | 5 to 30° +/- 0.8°<br>30 to 90° +/-0.5° |



\*Specifications are subject to change without notice