

# PowerDrive xCL

## At-bit rotary steerable system

### APPLICATIONS

- Appalachian Basin
- Pad and batch drilling operations
- Horizontal wells with long lateral sections
- Wells requiring high build rates and dogleg severity (DLS)
- Unconventional wells

### BENEFITS

- Enables single-run drilling of vertical, curve, and lateral sections with a single BHA
- Achieves high build rates while meeting lateral length requirements
- Increases leverage of force applied to bit by placing pistons with the cutting structure
- Improves control and reaction time

### FEATURES

- Application-specific Smith Bits PDC bit design
- Nonmagnetic steering unit body
- Dual hydraulically activated pistons
- Inclination and azimuth closed loops to provide advanced automated tangent control
- Proprietary high endurance strength connector
- Near-bit measurements including
  - Inclination
  - Azimuthal
  - Gamma ray
  - Azimuthal gamma ray
  - HD surveying

The PowerDrive xCL\* at-bit rotary steerable system is specifically designed for the Appalachian Basin to enable drilling the curve and lateral in a single run. It enables achieving high build rates and extended lateral lengths in US land unconventional drilling applications. Especially where vertical, curve, and lateral sections are the same hole size, the PowerDrive xCL RSS reduces NPT by eliminating the need to change out the BHA for every section.

The PowerDrive xCL RSS uses piston technology to push against the borehole wall for propulsion; the pistons are placed next to the cutting structure for greater curvature leverage. The PowerDrive xCL RSS uses this leverage to achieve higher build rates with no additional application of hydraulic force. This provides the ability to meet both the build requirements in the curve section and the directional control requirements in the lateral section.

The PowerDrive xCL RSS steering unit incorporates metal-to-metal hydraulic seals which reduce erosion and increase hydraulic design capability for improved performance. In addition, the RSS can be adapted with XPC\* extreme-profile single shoulder connections to increase reliability during high-dogleg severity drilling in the Appalachian Basin. These connectors also enable compatibility with Smith Bits PDC bits equipped with the proper unique cutting elements for the basin's formation-specific challenges. The PowerDrive xCL and customizable bits work in concert to provide single-run drilling with greater drilling efficiency.

### Multiaxis measurements and automatic trajectory control for accurate well placement in shale and unconventional wells

The PowerDrive xCL RSS includes comprehensive six-axis continuous inclination and azimuth measurements. The multiaxial component enables automatic hold inclination and azimuth measurements for precise well positioning. This feature, along with self-steering capabilities, helps provide smooth tangents with minimized tortuosity. Near-bit extended-range gamma ray measurements provide additional well positioning data for improved real-time decision making.

### Azimuthal image gamma ray for improved steering in the curve and lateral sections

The PowerDrive xCL RSS can be configured with an onboard azimuthal image gamma ray cartridge to improve in-zone percentage and enable steering within the reservoir sweet spot. With an azimuthal gamma ray cartridge just 6 ft behind the cutting structure, operators can identify signs of changing lithology earlier to enact instant steering corrections.



*With the PowerDrive xCL RSS, the pistons are located closer to the cutting structure for greater dogleg leverage in single-run, single-BHA applications.*

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Specifications	PowerDrive xCL
Nominal OD (API)	6.75 in
Hole Size	8½ in
Overall length	13.92 ft [4.24 m]
Weight of assembly in air	1,464 lbm [664 kg]
Max. collar dogleg	16°/100 ft [16°/30 m] sliding 15°/100 ft [15°/30 m] rotating
Max. operating torque <sup>2</sup>	16,000 ft.lbf [21,700 N.m]
Max. operating load	1,100,000 lbf [4,900,000 N]
Max. weight on bit	As per cutting structure specifications
Max. lost circulation material	1.5 lbm/galUS [179.74 kg/m <sup>3</sup> ] medium nut plug
Flow Range <sup>3</sup>	250–650 galUS/min [946–2,460 L/min]
Lateral vibrations	Shock level <sup>3</sup> (>10 counts/s above 50-g <sub>n</sub> threshold), 30-min limit
Stick/slip	±100% mean rotational speed, 30-min limit
Max. rotational speed	350 rpm
Max. temperature <sup>4</sup>	302 degF [150 degC]
Max. hydrostatic pressure	20,000 psi [138 MPa]
Pressure drop across tool	56,000
Density (in lbm/galUS) x Flow <sup>2</sup> (in galUS/min)	
Recommended pressure drop across bit	300–1,200 psi [2,068–8,274 kPa]
Mud sand content	1% by volume
<b>Rotary connections</b>	
Collar upper connection	4½ IF box
Bit box	Bit cutting structure is incorporated into the tool
<b>Sensors</b>	
Bit face to gamma ray <sup>6</sup>	6.23 ft [1.89 m]
Bit face to accelerometers <sup>6</sup>	7.16 ft [2.18 m]
Bit face to magnetometers <sup>6</sup>	9.25 ft [2.82 m]
Inclination accuracy	0.11 (at 1 sigma level)
Azimuth accuracy	1.8 at 90° inclination (at 1 sigma level)
Gamma ray accuracy, azimuth 4-quadrant	±5% (30-s averaging window)
Shock detector threshold, radial	50 g <sub>n</sub> ±5 g <sub>n</sub> (±500 g <sub>n</sub> max peak)

<sup>1</sup> Engineered BHA and bit design is required to deliver optimum system performance.

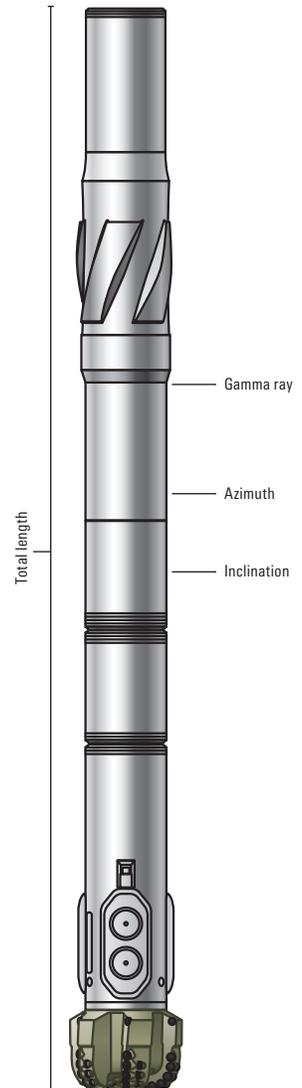
<sup>2</sup> Depending on weight on bit (WOB)

<sup>3</sup> Depending on mud weight values

<sup>4</sup> Optional 350 degF [175 degC] available

<sup>5</sup> Reference point for the PIP is the welded connection between the bit and tool body

<sup>6</sup> Measurements will vary slightly depending upon the cutting structure utilized.



[slb.com/powerdrivexcl](http://slb.com/powerdrivexcl)

**Schlumberger**