

Schlumberger



PowerDrive Orbit

Rotary steerable system

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The PowerDrive Orbit* rotary steerable system (RSS) is a highly reliable push-the-bit RSS that increases drilling efficiency and enhances trajectory control using a newly developed pad actuation design on any rig type worldwide.

Optimize directional drilling with the PowerDrive RSS family

The Schlumberger PowerDrive* RSS family includes a broad array of directional drilling technologies designed to deliver full rotation that reduces drag, improves rates of penetration (ROP), decreases stick/slip, and achieves superior hole cleaning in a variety of operating scenarios. The fully rotational steering systems improve penetration rates by eliminating stationary components that cause friction and inefficiency.



New Features and Benefits

- New pad design with metal-to-metal sealing to handle corrosive drilling fluids and severe downhole conditions
- Expanded revolution rate limits, supporting up to 350 rev/min from the current limit of 220 rev/min for higher ROP and stick and slip control
- Six-axis continuous inclination and azimuth measurements for better true-vertical-depth (TVD) definition and accurate well positioning
- Dual downlink options to fulfill all commands from surface in any rig type

PowerDrive Orbit RSS

PowerDrive Orbit RSS Drills 619 Meters in 283.3 Pumping Hours in a Single Run with Excellent Steerability

BHA drills record-breaking 8½-in section in the North Sea

Shell needed a reliable RSS that could sustain HPHT conditions, including measured static temperatures up to 165 degC, while keeping the well vertical.

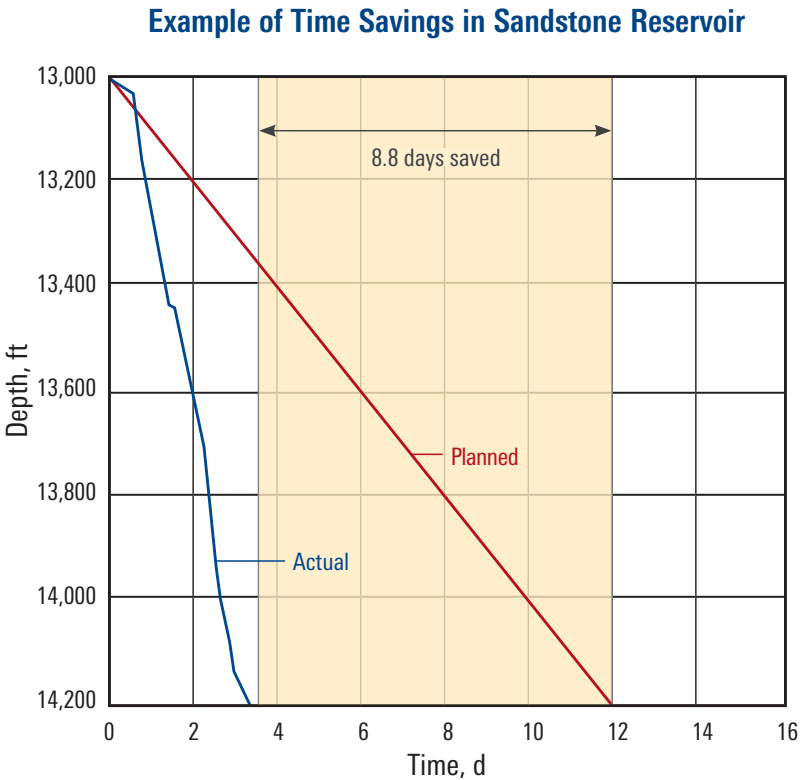


PowerDrive Orbit system, with its newly developed pad design and self-steering automation, helped improve ROP and drill from 4,085 to 4,704 m while keeping verticality of the well within 0.5 degrees.

Increases operating window in challenging drilling conditions

With wells becoming increasingly more complex, operators need solutions that go beyond the limits of conventional technology. The PowerDrive Orbit RSS expands the operating envelope of rotary steerable technology with features that deliver greater durability, reliability, and efficiency.

The system includes a newly developed actuation pad designed with metal-to-metal sealing to withstand the most aggressive drilling fluids and challenging hydraulic designs. The pad pushes against the formation to steer the well and provide precise directional control in complex 3D well trajectories.



PowerDrive Orbit RSS drilled an 8½-in section in approximately 3 days, 8.8 days faster than the operation's planned trajectory in the Misoa formation.

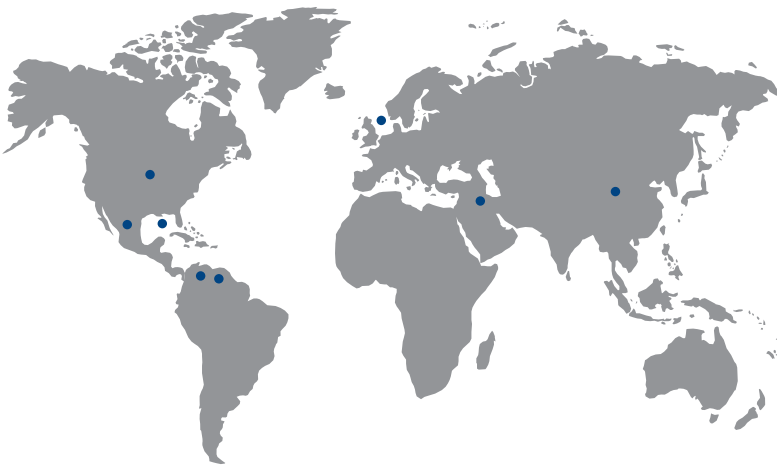
Delivers accurate well placement

The durable system also includes new and comprehensive six-axis continuous inclination and azimuth measurements. The multiaxial component allows automatic hold inclination and azimuth capability. The system also features self-steering capabilities making automatic adjustments in a closed-loop system to keep a specific inclination and azimuth. With better automatic trajectory control, hole quality is improved, the tangent is smoother, and tortuosity is minimized. This new feature also allows the most precise kickoff from vertical.

Extended range gamma ray measurements provide earlier identification of the zones of interest and valuable well placement data for real-time decision making.

Enhances drilling efficiency

The PowerDrive Orbit RSS is fully compatible with all existing BHA components being used today and complements other tools in the PowerDrive suite of services. The PowerDrive Orbit vorteX* motorized hybrid rotary steerable system (RSS), can perform at speeds up to 350 rev/min while still maintaining directional control and consistent steerability. Performing multiple functions while drilling, the time-saving system has been engineered to drill wells, from shoe to total depth (TD), in a single run.

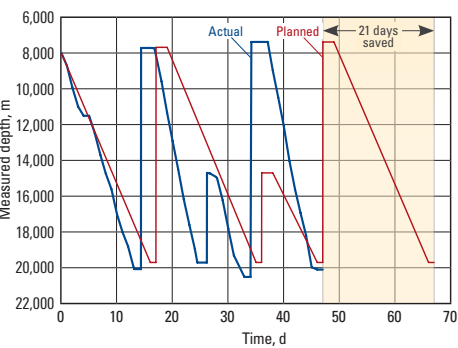


PowerDrive Orbit system has achieved successful runs in conventional and complex environments across the globe, including in the Middle East, United States, Gulf of Mexico, Mexico, Colombia, Venezuela, China, and the North Sea.

PowerDrive Orbit RSS Helps Save 21 Days and Increase Lateral Length by 33%

Middle East operator drills a new record 6½-in hole 12,690-ft deep in a single run

An operator needed an RSS that could maintain directional control while drilling deep laterals in a field that presented high stick/slip and severe shock levels.



Despite high stick/slip peak values reaching 350 rpm, the PowerDrive Orbit RSS helped overcome severe torque and drilled a record 12,690 ft in a single run, 21 days ahead of schedule.

PowerDrive Orbit RSS

The pad actuation design of the RSS performs in the most difficult drilling conditions. An additional pad design, built for greater durability, serves as an option for highly abrasive formations.



Deeper drilling,
faster performance,
excellent directional
control—from shoe
to TD, in one run

Expanded applications with dual downlink communication

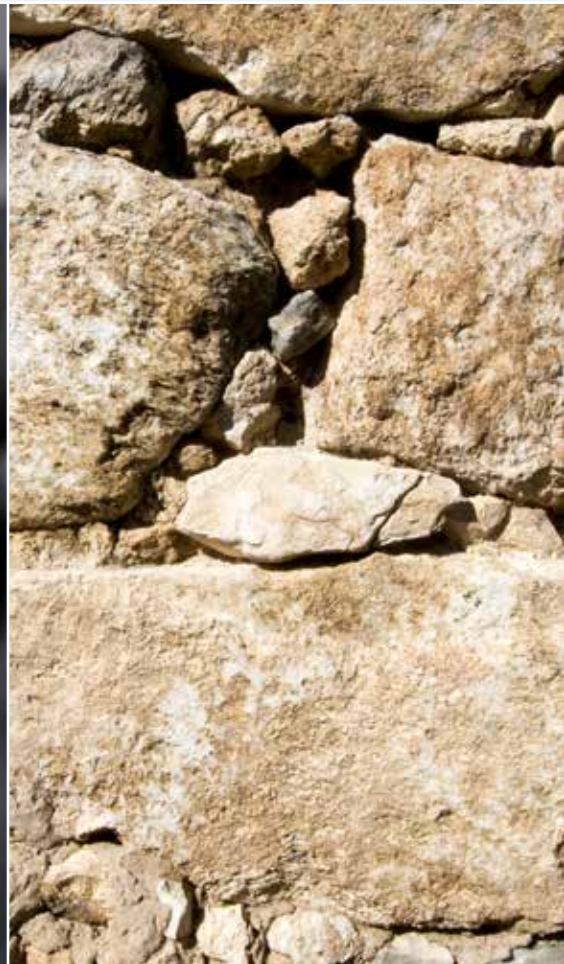
The system offers dual downlink capabilities—the first option allows for downlink activation by a traditional flow change command, and the second is a new collar RPM-based feature that allows direct activation by changing the collar rotation rate.

The flow change command, which is typically used, is less affected by high stick/slip and high torque. The new collar RPM-based command is less affected by the slow reaction from the mud pumps when drilling. This application enables an RSS to be run on any type of rig, including mechanical rigs without a silicon-controlled rectifier, which require fast-reacting manipulation of surface pumps to send the command.

Specifications				
	PowerDrive Orbit 475	PowerDrive Orbit 675	PowerDrive Orbit 900	PowerDrive Orbit 900 Large Borehole
Nominal OD (API)	4.75 in	6.75 in	9.625 in	9.625 in
Hole size	5¼ in to 6¾ in	8½ in to 8¾ in	12¼ in to 14¾ in	16 to 18⅝ in
Overall length	13.5 ft	13.53 ft	14.00 ft	14.27 ft
Max. collar dogleg	30°/100 ft [30°/30 m] sliding, 10°/100 ft [10°/30 m] rotating	16°/100 ft [16°/30 m] sliding, 8°/100 ft [8°/30 m] rotating	10°/100 ft [10°/30 m] sliding, 5°/100 ft [5°/30 m] rotating	8°/100 ft [8°/30 m] sliding, 4°/100 ft [4°/30 m] rotating
Build rate	0°– 8°/100 ft	0°– 8°/100 ft	0°– 5°/100 ft	0°– 3°/100 ft
Max. operating torque [†]	9,000 ft.lbf [12,200 N.m]	16,000 ft.lbf [21,700 N.m]	48,000 ft.lbf [65,000 N.m]	48,000 ft.lbf [65,000 N.m]
Max. operating load	340,000 lbf [1,500,000 N]	1,100,000 lbf [4,900,000 N]	1,400,000 lbf [6,200,000 N]	2,280,000 lbf [10,140,000 N]
Max. weight on bit	As recommended by drill bit vendor	As recommended by drill bit vendor	As recommended by drill bit vendor	As recommended by drill bit vendor
Weight of assembly in air	584 lbs	1,276 lbs	2,445 lbs	2,729 lbs
Max. lost circulation material	35 lbm/bbl medium nut plug	50 lbm/bbl medium nut plug	50 lbm/bbl medium nut plug	50 lbm/bbl medium nut plug
Flow range [‡]	170–330 galUS/min [645–1,250 L/min]	250–950 galUS/min [946–3,590 L/min]	350–2,000 galUS/min [1,325–7,570 L/min]	350–2,000 galUS/min [1,325–7,570 L/min]
Lateral vibrations	Shock level 3 (50-gn threshold), 30-min limit	Shock level 3 (50-gn threshold), 30-min limit	Shock level 3 (50-gn threshold), 30-min limit	Shock level 3 (50-gn threshold), 30-min limit
Stick/slip	± 100% mean rotational speed, 30-min limit	± 100% mean rotational speed, 30-min limit	± 100% mean rotational speed, 30-min limit	± 100% mean rotational speed, 30-min limit
Max. rotational speed	350 rpm	350 rpm	350 rpm	350 rpm
Max. temperature [§]	302 degF [150 degC]	302 degF [150 degC]	302 degF [150 degC]	302 degF [150 degC]
Max. hydrostatic pressure	20,000 psi [138 MPa]	20,000 psi [138 MPa]	20,000 psi [138 MPa]	20,000 psi [138 MPa]
Pressure drop across tool	Density (in lbm/galUS) × Flow ² (in galUS/min)	Density (in lbm/galUS) × Flow ² (in galUS/min)	Density (in lbm/galUS) × Flow ² (in galUS/min)	Density (in lbm/galUS) × Flow ² (in galUS/min)
	14,500.00	56,000.00	259,000.00	337,500.00
Mud sand content	1% by volume	1% by volume	1% by volume	1% by volume
Rotary Connections				
Collar upper connection	3½ IF box	4½ IF box	6 Reg box	7⅝ Reg box
Bit box	3½ Reg	4½ Reg	6⅝ Reg	7⅝ Reg
Sensors				
Bit box to gamma ray	5.86 ft [1.79 m]	6.40 ft [1.95 m]	7.56 ft [2.30 m]	7.97 ft [2.43 m]
Bit box to inclination	6.73 ft [2.05 m]	7.27 ft [2.21 m]	8.43 ft [2.57 m]	8.83 ft [2.69 m]
Bit box to azimuth	8.83 ft [2.69 m]	9.37 ft [2.85 m]	10.53 ft [3.21 m]	10.93 ft [3.33 m]
Inclination accuracy	0.11 (at 1 sigma level)	0.11 (at 1 sigma level)	0.11 (at 1 sigma level)	0.11 (at 1 sigma level)
Azimuth accuracy	1.8 at 90° inclination (at 1 sigma level)	1.8 at 90° inclination (at 1 sigma level)	1.8 at 90° inclination (at 1 sigma level)	1.8 at 90° inclination (at 1 sigma level)
Gamma ray accuracy, azimuthal 4-quadrant	± 5% (30-s averaging window)	± 5% (30-s averaging window)	± 5% (30-s averaging window)	± 5% (30-s averaging window)
Shock detector threshold, radial	50 gn ± 5 gn (± 500 gn max. peak)	50 gn ± 5 gn (± 500 gn max. peak)	50 gn ± 5 gn (± 500 gn max. peak)	50 gn ± 5 gn (± 500 gn max. peak)

[†]Depending on WOB.
[‡]Depending on mud weight values.
[§]Optional 350 degF [175 degC] available.

PowerDrive Orbit



With performance focused design, high-speed capabilities, and long durability, the PowerDrive Orbit rotary steerable system improves drilling efficiency and well placement in all conventional and complex environments.

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