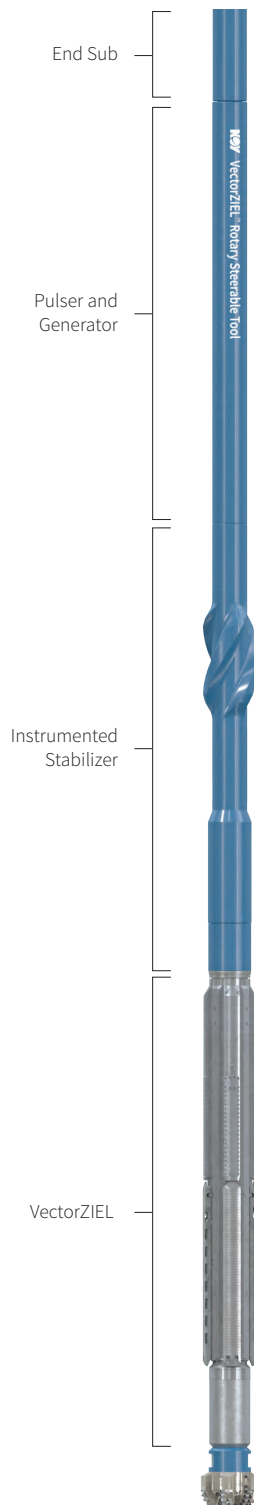


VectorZIEL Rotary Steerable System

The VectorZIEL™ rotary steerable system is an automatic steering tool for three-dimensional drilling. Offering higher ROP, improved cuttings removal, and precise trajectory control, the system helps you produce higher quality boreholes at reduced operational costs.

Based on a design that has been developed and refined over the past 20 years, the VectorZIEL tool offers reliable and precise directional control, even in the most demanding applications. The VectorZIEL tool is available for purchase or rental, and it's supported by NOV's global maintenance infrastructure, enabling directional drillers to offer high-tier directional drilling services around the world.



Features

- Integrated MWD system for real-time feedback while drilling
- Near-bit inclination, azimuth, and gamma measurements
- Closed loop trajectory control, which requires minimal intervention from surface
- Automated downlinking using surface downlink skid
- Can be combined with NOV's MWD and LWD tool portfolio for an integrated directional drilling and logging BHA

Specifications of MWD System

Inclination

Sensor.....	X, Y, and Z-axis accelerometers
Accuracy.....	± 0.1°
Raw data to surface.....	G _x , G _y , G _z
Gtot quality check tolerance.....	± 0.005 g

Direction

Sensor.....	X, Y, and Z-axis magnetometers
Accuracy.....	± 1.0°
Raw data to surface.....	B _x , B _y , B _z
Btot quality check tolerance.....	± 0.3 μ T
Dip angle quality check tolerance.....	± 0.5°

Logging

Logging capability.....	Gamma sensor
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Components at Surface

- Data receiving unit
- Electro-hydraulic choke mechanism for downlink

VectorZIEL Rotary Steerable System

Tool Specifications

Series	400		600		800	
Body diameter	4¾ in.	121 mm	6¾ in.	172 mm	8 in.	203 mm
Hole size	6 to 6¾ in.	152 to 171 mm	8½ to 9⅞ in.	216 to 251 mm	12¼ to 13⅞ in.	311 to 352 mm
Stabilizer under gauge size	⅞ in.	3 mm	⅞ in.	3 mm	⅞ in.	3 mm
Max Build-up rate	8°/100ft	8°/30m	8°/100ft	8°/30m	6°/100ft	6°/30m
Maximum pass through/ Rotate through DLS	16°/8°		16°/8°		10°/6°	
Bit to sensor distance (Inc/Az/GR)	4.10 ft	1.25 m	4.10 ft	1.25 m	5.74 ft	1.75 m
Overall length	33.81 ft	10.31 m	35.48 ft	10.81 m	39.87 ft	12.15 m
Weight	1,400 lbs	640 kg	3,350 lbs	1520 kg	7,200 lbs	3220 kg
Maximum operating torque	8,100 ft-lbf	11 000 Nm	11,000 ft-lbf	15 000 Nm	22,000 ft-lbf	30 000 Nm
Maximum weight on bit	16,000 lbf	72 kN	45,000 lbf	200 kN	56,000 lbf	250 kN
Maximum rotational speed	400 RPM		400 RPM		300 RPM	
Flow range	210 to 290 gpm	800 to 1100 l/min	290 to 600 gpm	1100 to 2300 l/min	500 to 1,100 gpm	1900 to 4100 l/min
Maximum temperature	302°F	150°C	302°F	150°C	302°F	150°C
Maximum hydrostatic pressure	20,000 psi	1400 bar	20,000 psi	1400 bar	20,000 psi	1400 bar
Maximum over-pull	108,000 lbf	480 kN	153,000 lbf	681 kN	524,000 lbf	2332 kN
Mud compatibility	OBM/WBM		OBM/WBM		OBM/WBM	
Maximum mud sand content	1%		1%		1%	
Maximum LCM amount/size	40 ppb/ medium nut plug		40 ppb/ medium nut plug		40 ppb/ medium nut plug	
Collar upper connection	NC 38 Box		NC 50 Box		6⅝ in. REG Box	
Bit box connection	3½ in. REG Box		4½ in. REG Box		6⅝ in. REG Box	