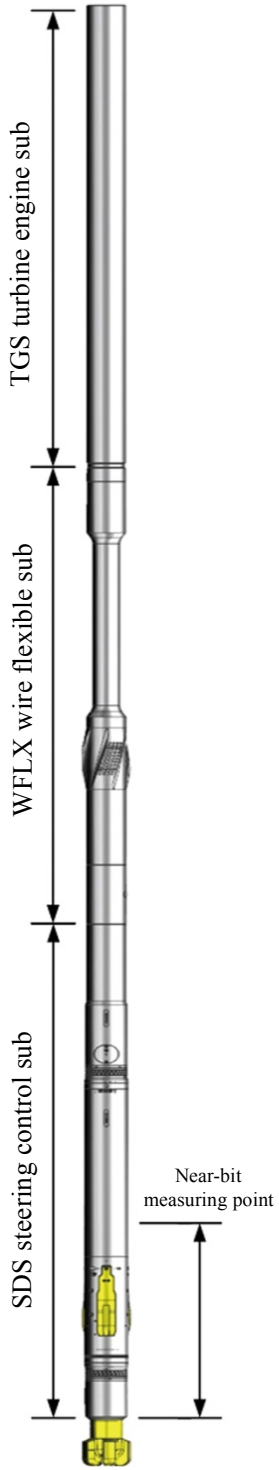
Welleader® Rotary Steering Drilling System

The Welleader® rotary steering drilling system made by COSL could control the well track automatically while drill stem rotates. The system could realize fast response to drill bit position through precise guiding force vector control, with the capacity of measuring the high-precision near-bit hole drift angle and tool face azimuth, and could realize automatic closed-loop control of the well deviation, adapt to complicated formation condition and drilling condition and complete the drilling operations of directional well, directional well with complex 3D trajectory, extended-reach well, etc., with powerful well track control capacity and better well body quality. This system could integrate with Drilog® LWD system of COSL to realize precise geo-steering drilling.

- Rotary Directional Drilling

  The Welleader® Rotary Steering Drilling System could realize the precise guiding control when the drilling rig drills in a rotary manner, with little torque and friction, smooth drilled borehole and short well construction cycle, so it could reduce the construction costs of drilling effectively.

- Real-time ground control



Send the ground control instruction to downhole via program-controlled shunting device CDL. Welleader® analyzes and implement the instruction through detecting the changes in mud displacement. The instruction could be sent down to the well while drilling, without affecting the drilling time-efficiency.

- Precision Closed-loop Control

  The guiding unit of Welleader® system controls the guiding force of three guiding ribs in a closed loop by driving the hydraulic system of the motor pump, and forms stable size and orientation of guiding resultant force. The guiding data and instrument state could be uploaded in real time via MWD during the directional drilling, and the engineer of the directional well could send down the instruction in real time to control the well track as required.

- Near-bit Measurement

  Welleader® near-bit measurement module is located within 1.3m behind the drilling bit (the instrument of 675 Series is 1.1m), and could obtain the instrument position and near-bit well deviation at the first time, so as to provide precise guidance for steering control.

- Multiple control modes

  Welleader® supports multiple control modes like guiding mode, centering guide mode, angle holding mode, etc., and could also set the target well deviation to control the drill bit to drill at the angle holding mode.

- Power Supplied by Turbine Generator

  Welleader® comes with a high power turbine generator, which could provide stable power for steel control unit. The turbine of the generator could be selected according to the specific situation of site, and is applicable to multiple displacement range.

- Power Trajectory Control Ability

  The stable Welleader® trajectory control ability has bee verified in actual drilling in different geological environment in Xinjiang, Northeast, North China, the Bohai Sea, etc., and its series of instrument is applicable to the borehole of 8.5″ and 12.25″, and the dogleg angle can be controlled up to 6.5° when drilling 30m actually.

- Real-time Geosteering

Welleader® could be connected to Drilog® seamlessly, and the geological engineer could obtain LWD data at the first place as well as make real-time decision, optimize and adjust the well track to realize precise landing and interlayer drilling.

Instrument Specifications	675 Series	950 Series
Outer diameter of instrument	178mm	244mm
Total length of instrument	8.03 m	10.24 m
Applicable borehole	215.9mm（8-1/2″） Standard	311mm（12-1/4″） Standard
buildup rate	0～6.5°	0～6°
Type of connection buckle	Upper part: 5-1/2″API IF. Box Lower part: 4-1/2″API Reg.Box	Upper part: 6-5/8″API Reg. Box Lower part: 6-5/8″API Reg. Box
Applicable Displacement	1500～2400 L/min	2200～5600 L/min
Maximum revolving speed	160 rpm	
Maximum Torque	20 kNm	45 kNm
Maximum bit pressure	20 t	35 t
Maximum working temperature	150 ℃	
Maximum working pressure	20000 psi	
Maximum vibration	20 grms(5Hz～1 kHz)	
Highest impact	500 g@1ms half sine	
Well deviation	Range 0～180; accuracy ±0.1° (well deviation is greater than 5°)	
Near-bit Measurement of distance to drill bit	1.1 m	1.3 m
Power supplied by generator	300 W	500 W
Instruction downlink	Program controlled shunt/shut down pump	

Steering control	Steering strength/steering angle/working mode

Wellbore A4

Azimuths to Grid North
True Noth:0.99d
Magnetic North:-5.54d
Magnetic Field
Strength:53226.8nT
Dip Angle:56.45d
Date:2013/12/26
Model: WMM_2015