



Wolverine
Oilfield Technologies

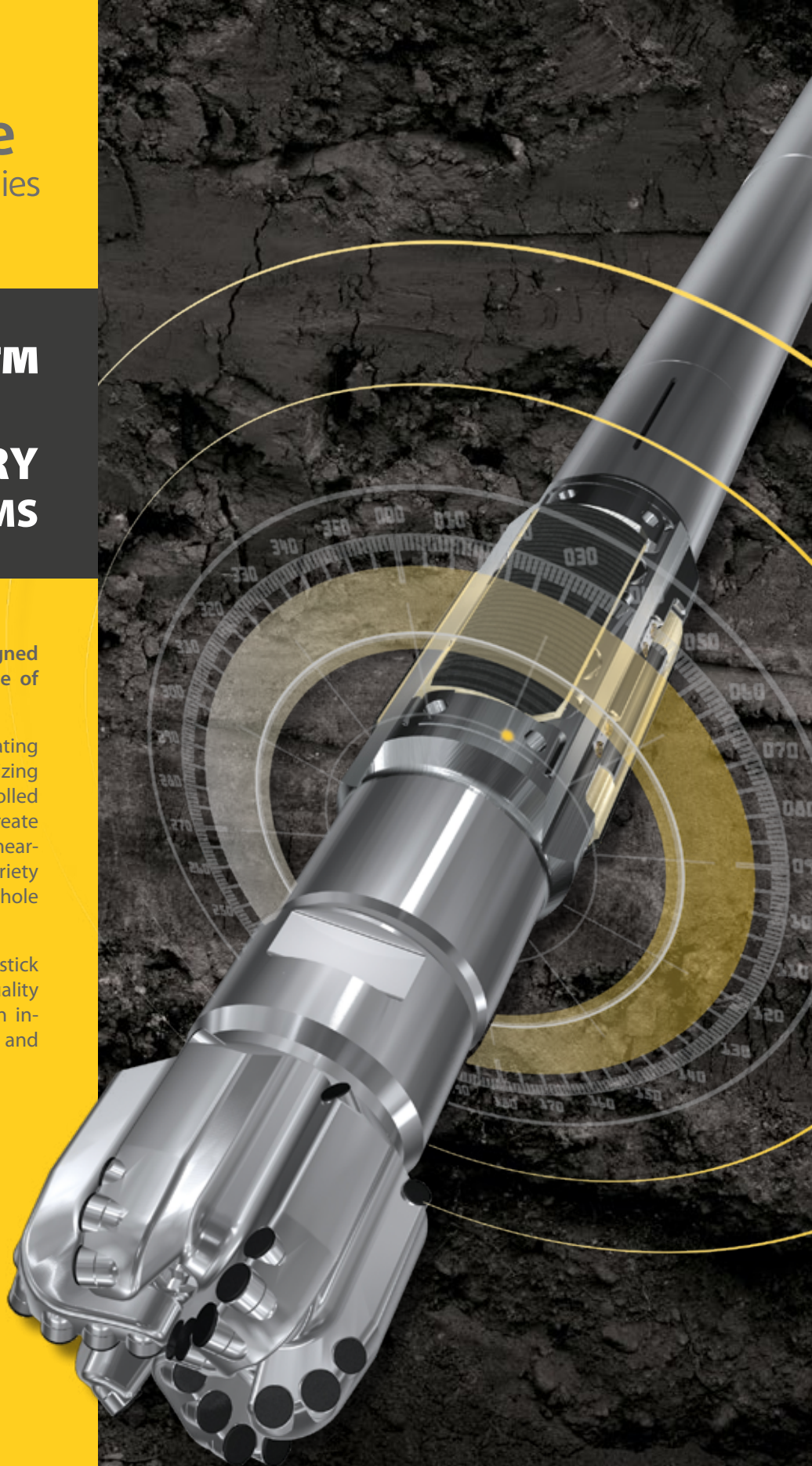
ZENITH™

475 & 675 ROTARY STEERABLE SYSTEMS







The Zenith™ RSS was specifically designed to provide a cost-effective tool capable of producing complex well trajectories.

The Zenith™ RSS is a continuously rotating push-the-bit rotary steerable system, utilizing mud-powered electronically controlled thrust pads located close to the bit to create the steering vector. The RSS is run with a near-bit stabilizer to allow it to be run in a variety of borehole diameters, and bottom hole assemblies.

Full and continuous rotation will reduce stick and slip risks, will increase ROP and the quality of wellbore cleanout, and will ensure an in-gauge wellbore for better log quality and faster casing and completion running.



www.wolverineoft.com
1-713-589-2035
info@wolverineoft.com

-  **PUSH-THE-BIT
3 THRUST PADS**
-  **DOGLEG SEVERITY
10°**
-  **NEAR-BIT INCLINATION &
AZIMUTH 475
13 FT**
-  **NEAR-BIT GAMMA 475
12 FT**
-  **NEAR-BIT INCLINATION &
AZIMUTH 675
8.9 FT**
-  **NEAR-BIT GAMMA 675
5.7 FT**

**ZENITH™ 475
TECHNICAL SPECIFICATIONS**

SENSORS		
MEASUREMENT	OFFSET	ACCURACY
PRESSURE (BORE AND ANNULUS)	84.6" [2149]	± 10 PSI [± 0,68 ATM]
GAMMA	145.6" [3698]	± 5%
INCLINATION		± 0.2°
AZIMUTH	164.6" [4181]	± 2° @ 90°

CONFIGURATIONS		
HOLE SIZE	PAD OD	STABILIZER OD
5 7/8" [149,2]	5 3/4" [146]	5 3/4" [146]
6" [152,4]	5 7/8" [149,2]	5 7/8" [149,2]
6 1/8" [155,6]	6" [152,4]	6" [152,4]
6 1/2" [165,10]	6 3/8" [161,9]	6 3/8" [161,9]

MECHANICAL PARAMETERS	
OVERALL LENGTH	27.96" [8522]
UPPER CONNECTION	NC 38 (3 1/2" IF) BOX
LOWER CONNECTION	3 1/2" REG BOX
TOOL WEIGHT (IN AIR)	1400 LB [635 KG]

ENVIRONMENTAL CAPABILITIES	
MAX TEMPERATURE	150 °C, 175 °C SURVIVAL
MAX PRESSURE	20,000 PSI [1360 ATM]
MAX VIBRATION	20 G RMS 50-500 HZ RANDOM

OPERATIONAL PARAMETERS	
BUILD RATE	10° / 100' [10° / 30 M] MAXIMUM
ROTARY	MAXIMUM 160 RPM REDUCED DLS
WEIGHT ON BIT	BIT LIMITED
TORQUE	10,000 FT-LBS [13558,17 NM]
PRESSURE THROUGH BIT	200-500 [13,6 - 24 ATM]
FLOW RATE	450 GPM [28,39 L/S] MAX
LCM	20 LB/BARREL [57 KG/M3] MAX
SAND	1% MAX
COMPATIBLE MWD	Neutrino, TolTeq, Tensor, Telemetry, XXT (Enteq)
PASS THROUGH SLIDING	18° / 100' [18° / 30 M]
PASS THROUGH ROTATING	15° / 100' [15° / 30 M]
OVERPULL	300,000 LBS [136 T]

Imperial UOM [Metric UOM]

**ZENITH™ 675
TECHNICAL SPECIFICATIONS**

SENSORS		
MEASUREMENT	OFFSET	ACCURACY
PRESSURE (BORE AND ANNULUS)	35.3" [897]	± 10 PSI [± 0,68 ATM]
AZIMUTHAL GAMMA	67.9" [1725]	± 5%
INCLINATION		± 0.2°
AZIMUTH	106.5" [2704]	± 2° @ 90°
VIBRATION (3 AXIS)	77.5" [1969]	±200g (RANGE)







CONFIGURATIONS		
HOLE SIZE	PAD OD	STABILIZER OD
8 1/4" [209,55]	7 3/4" [196,85]	8 1/8" [206,37]
8 1/2" [215,9]	8" [203,2]	8 3/8" [212,73]
8 7/8" [225,43]	8 1/4" [209,55]	8 3/4" [222,25]

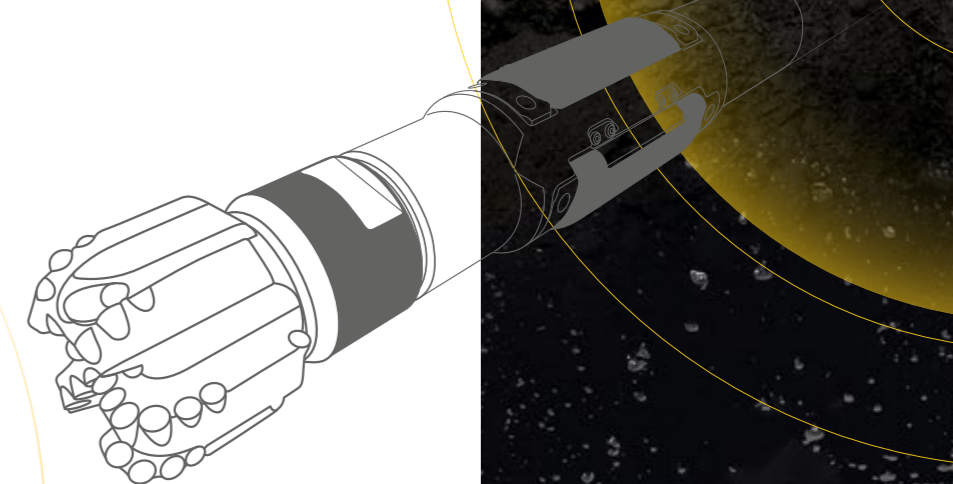
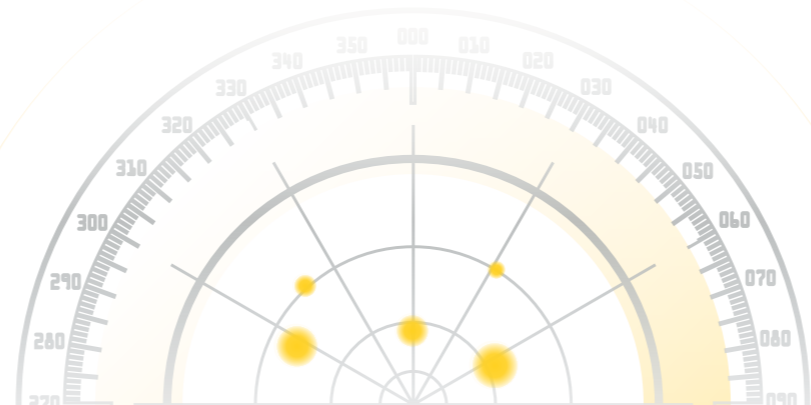
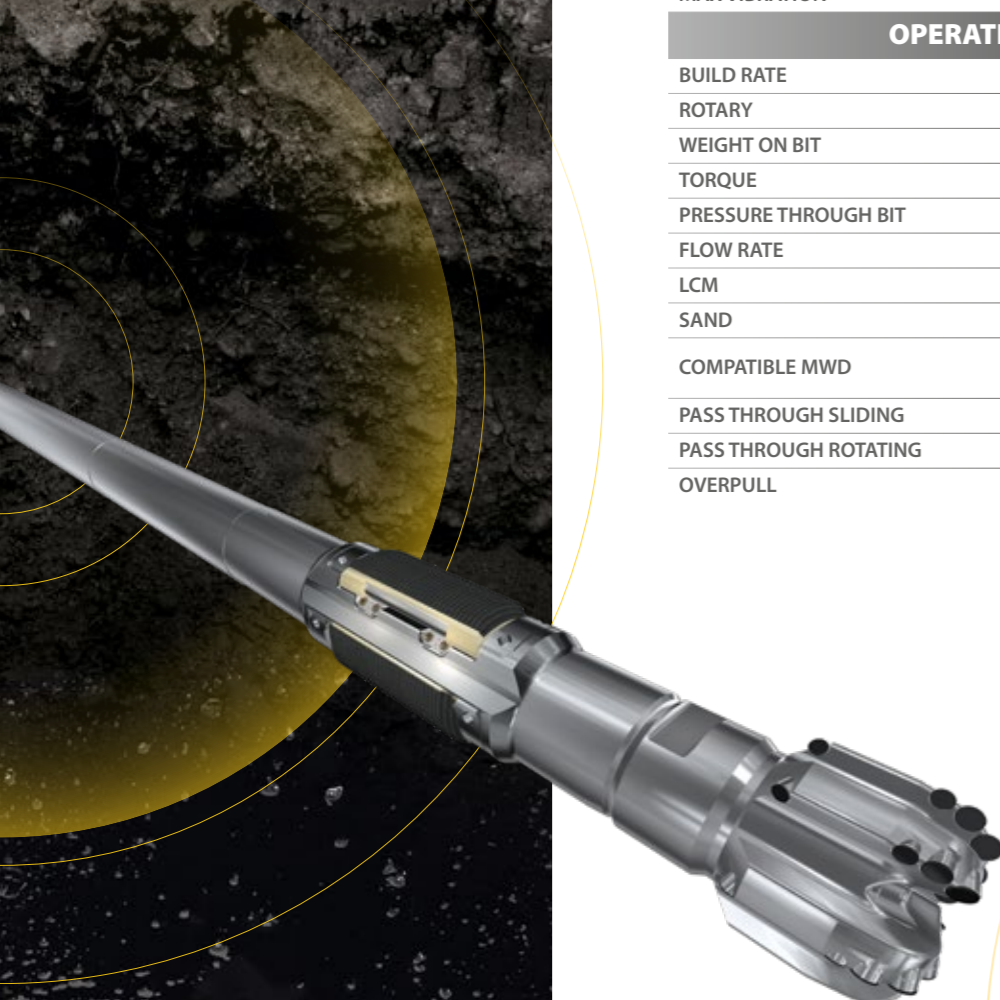
MECHANICAL PARAMETERS	
OVERALL LENGTH	27.79" [8471]
UPPER CONNECTION	NC 50 (4 1/2" IF) BOX
LOWER CONNECTION	4 1/2" REG BOX
TOOL WEIGHT (IN AIR)	2600 LB [1179,3 KG]
TOOL OD (NOMINAL)	6 3/4" [171,45]
FLEX SECTION OD	5 7/8" [149,22]

ENVIRONMENTAL CAPABILITIES	
MAX TEMPERATURE	150 °C, 175 °C SURVIVAL
MAX PRESSURE	20,000 PSI
MAX VIBRATION	20 G RMS 50-500 HZ RANDOM

OPERATIONAL PARAMETERS	
BUILD RATE	10° / 100' [10° / 30 M]
ROTARY	MAXIMUM 350 RPM REDUCED DLS
WEIGHT ON BIT	BIT LIMITED
TORQUE	16,500 FT-LBS [22371 NM]
PRESSURE THROUGH BIT	250 - 500 PSI [17 - 34 ATM]
FLOW RATE	300 - 600 GPM [22,73 - 45,46 L/S]
LCM	20 LB/BARREL [57 KG/M3] MAX
SAND	1% MAX
COMPATIBLE MWD	Neutrino, TolTeq, Tensor, Telemetry, XXT (Enteq)
PASS THROUGH SLIDING	16° / 100'
PASS THROUGH ROTATING	10° / 100'
OVERPULL	500,000 LB [2,224,000 N] [226,79 T]

Imperial UOM [Metric UOM]

- RUGGED & ROBUST DESIGN** 
- HIGH-SPEED MWD INTEGRATION** 
- UNPARALLELED ECONOMICS** 
- INCREASED DURABILITY** 
- HIGH PERFORMANCE DRILLING** 
- PRECISE DIRECTIONAL CONTROL** 
- POWERED BY DRILLING FLUID** 
- FIELD SERVICEABLE** 



FULLY ROTATING PUSH-THE-BIT

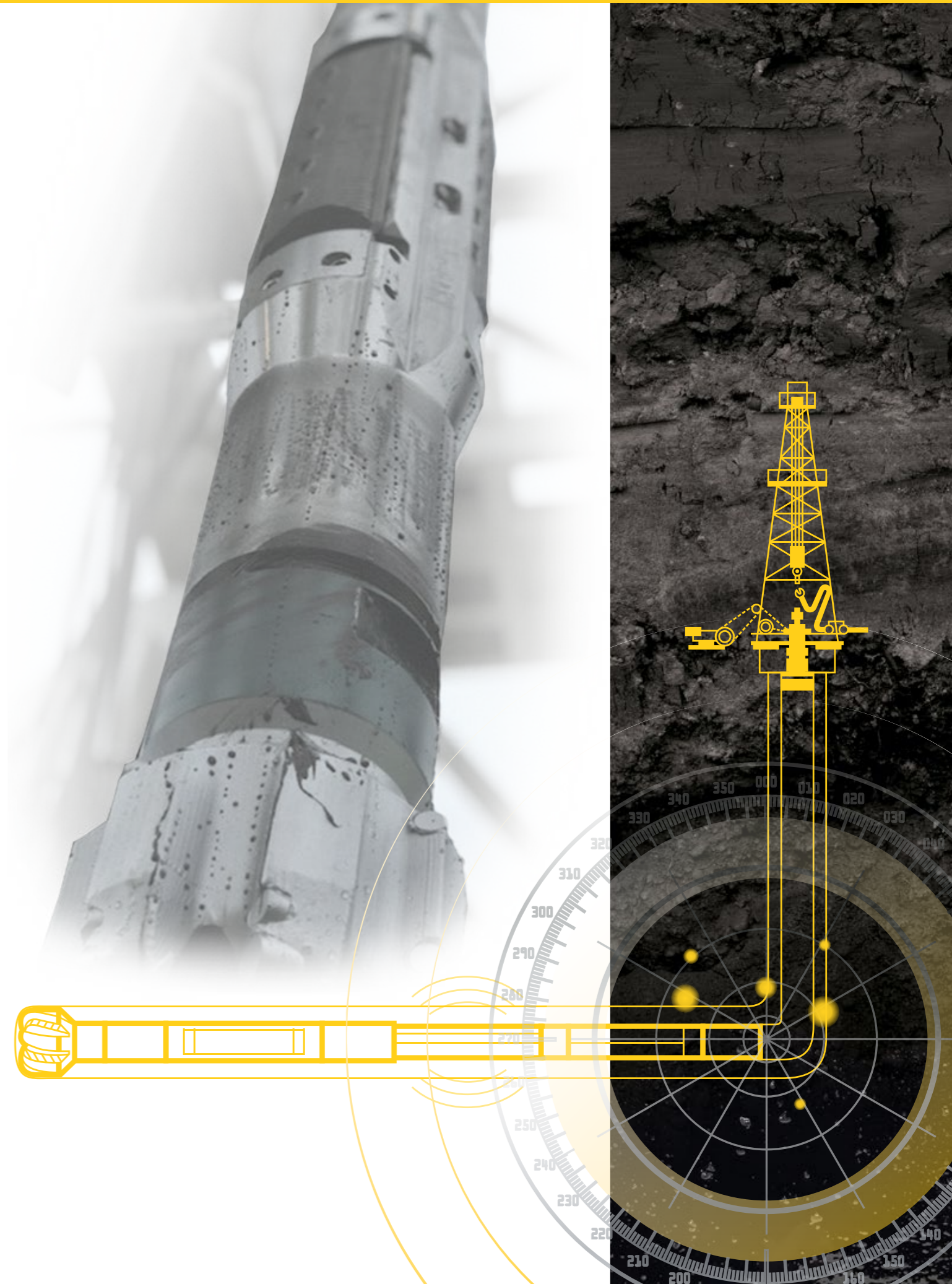
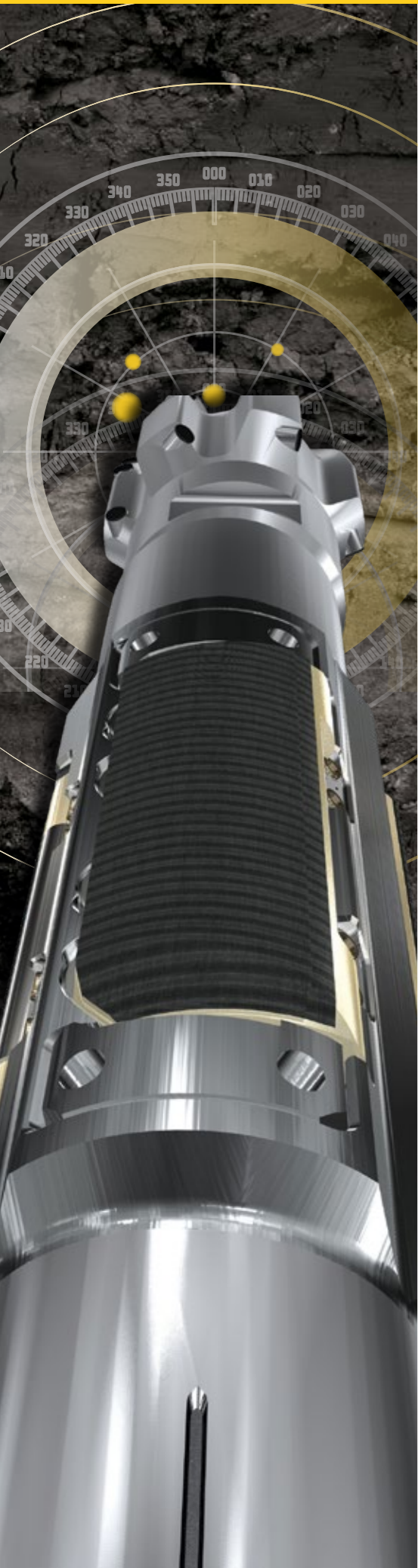
ROTARY STEERABLE SYSTEM

FEATURES

- Simple and robust
- Full and continuous rotation
- Push-the-bit configuration
- Thrust pads close to the bit
- Mud-powered and electronically controlled
- Adjustable stabilizer configuration
- Compatible with numerous BHA configurations
- Compatible with a mud motor BHA to increase ROP
- Integration with any MWD system
- Tool setup and control software
- Near bit real-time gamma, inclination, and azimuth

BENEFITS

- Applicable in wells of any complexity on land and offshore markets
- Assembled and programmed in the shop
- Picked up at the rig as one collar
- Optimized steering, drilling performance, and directional control
- Better borehole quality and clean-out
- Increased ROP
- Reduced stick and slip risks
- Target depth on time and on budget
- Smooth and in-gauge wellbores for better log quality and faster casing and completion



ENGINEERING EXCELLENCE

OUR TEAM LEADERS

EXPERIENCE

27 YEARS

- Baker Hughes
- Weatherford
- Several Independents
- Wolverine Oilfield Technologies

EXPERIENCE

30 YEARS

- Sperry Drilling
- Baker Hughes
- Halliburton Director of Technology
- Wolverine Oilfield Technologies

EXPERIENCE

10 YEARS

- Weatherford
- Wolverine Oilfield Technologies

EXPERIENCE

25 YEARS

- Sperry Drilling
- Weatherford
- Several Independents
- Wolverine Oilfield Technologies

EXPERIENCE

8 YEARS

- National Oilwell Varco
- Wolverine Oilfield Technologies

Comprising of industry leading mechanical, electrical and software engineers, Wolverine Oilfield Technologies puts leading-edge technology solutions within the grasp of industry directional services companies and operators.



BRYAN GONSOULIN

Managing Member // Electronics/Software Design

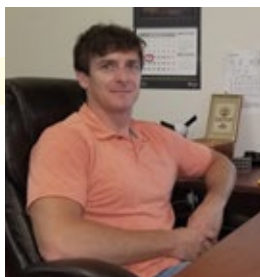
Bryan's technical background is in electronics/software, electro-mechanical actuators, directional sensors, and control algorithms.



MICHAEL WOODS

Managing Member // Mechanical Systems Design

Michael's technical background includes design and development of complex mechanical systems, downhole robotics, downhole and surface mud pulse transmitters, and rotary steerable systems.



ROBERT CONGER

Project Manager // Mechanical Engineer // Lead Test Engineer

Robert's early work that provided significant performance increases of downhole MWD tools and mud pulsers, was followed by a start-to-finish design and development cycle of a commercially successful rotary steerable tool.



JOHN MENCONI

Mechanical Systems Engineer & Advisor

John's role has been the development of novel, high-performance electro-mechanical actuators that allow us to achieve completely independent pad control in our motor-driven, fully rotating RSS.



THUAN VU

Software Engineer // Performance Test & Verification

Thuan began his career at NOV, where, after completing extensive training rotations through field and engineering departments, made outstanding contributions to their product testing and sustaining engineering group. He now develops our software applications that collect and analyze downhole tool data, providing the critical performance measurements that allow us to finely tune our systems for maximum reliability.

Wolverine Oilfield Technologies is a subsidiary of Frontier International, a global oilfield service company providing high-tech solutions to the oil and gas industry for over a decade.

Frontier International develops technology within the following Business Divisions: Drilling Services, Completion Systems and Capital Equipment; and comprises of a number of manufacturing and operating companies. Frontier International supplies technology products and services to the oil and gas exploration and production industry in Europe and CIS, Middle East, North and South America.

Wolverine Oilfield Technologies is a MWD-LWD and drilling tool technology design and manufacturing company providing high-tech solutions to oil and gas customers since 2015. Based in Houston and comprising of industry leading mechanical, electrical and software engineers, Wolverine Oilfield Technologies was created to put leading edge technology solutions within the grasp of industry directional services companies and operators.



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