IONOS DIRECTIONAL SERVICES

OCTUBRE 2024

QUIENES SOMOS

Ionos Directional Services es una empresa líder en servicios de perforación direccional y registros nucleares de hueco abierto, reconocida por su excelencia en el servicio, compromiso, calidad, soluciones tecnológicas e innovación. Nuestra combinación de tecnologías de vanguardia, experiencia internacional y desarrollo de herramientas direccionales nos permite ofrecer soluciones profesionales y eficientes para proyectos de perforación en Colombia, México, Paraguay y próximamente en Perú y Brasil.

NUESTRO EQUIPO

El equipo de Ionos Directional Services se encarga de definir, estudiar y ejecutar con precisión todos los procesos involucrados en la perforación de pozos, garantizando la intercepción de objetivos específicos desde una ubicación predeterminada. Complementamos nuestros servicios con registros nucleares de hueco abierto para una evaluación geológica y petrofísica exhaustiva de las formaciones perforadas.

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TIME LINE

Jan 2013

Ionos Directional Services

The company started operacions

March 2013-2014

First Operations

Directional Drilling Services Plato 1XP
Mauritia 3 well - Llanos 10.500ft

April 2015-Aug 2016

Diversification & Internationalization

HDD 4.500ft - Colombia Ecuador
Directional well - S type 10.200ft
Jaguarete - Paraguay - Amerisur

June 2017

New Services

Sidetracks 17 wells - 2.500ft - 3.000ft
Directional drilling wells MWD/LWD
1 Well Curito 6 Llanos - 10.500ft

November 2018-2019

Consolidation

Drilling Campaign 42 wells 2.500ft -3.000ft Mansarovar E.
Directional Drilling Services with Hocol, Oxy, Gran Tierra, ETC

December 2019-2020

New Technologies

Performance Drilling.
Extrem MWD & Evenwall Motors.
Logging while tripping (DEN-NEU-GR)
Mexico Operations with 3 DD Wells

June 2021 August 2022

Developed Operations

73 well running MWD/LWD & LWT .
Performance drilling Reamer and Stabilizer.
More than 42 logged wells (DEN-NEU) More than 64 LWD Wells (RES-GR)

Jan- Dec 2023

Developed New Customer

1 Well DD/LWD Clarinete 8 Canacol E.
3 Wells DD/LWD/LWT Llanos Perenco.
More than 22 logged wells (DEN-NEU) .
More than 18 LWD Wells (RES-GR)

Jan 2024

Ionos DS growth

Achive 15% Market share DD
Planning 11 DD wells with Mansarovar
Planning more than 80 wells with LWD & LWT Sierracol .
Launch of triple Combo RT Operations.

Jan 2024-Aug 2024

Increasing our Portafolio

Bringing more tools

MTBF

545.75 HRS
NPT 1.48%
PRODUCTIVE TIME 98.49%

300 WELLS DRILLED

COLOMBIA
MEXICO
PARAGUAY

909.898FT DRILLED

MORE THAN 150 WELLS LOGGED WITH LWD GR+RESS

MORE THAN 130 WELLS LOGGED WITH LWT

- Density neutron
- Resistivity induction
- Gamma Ray

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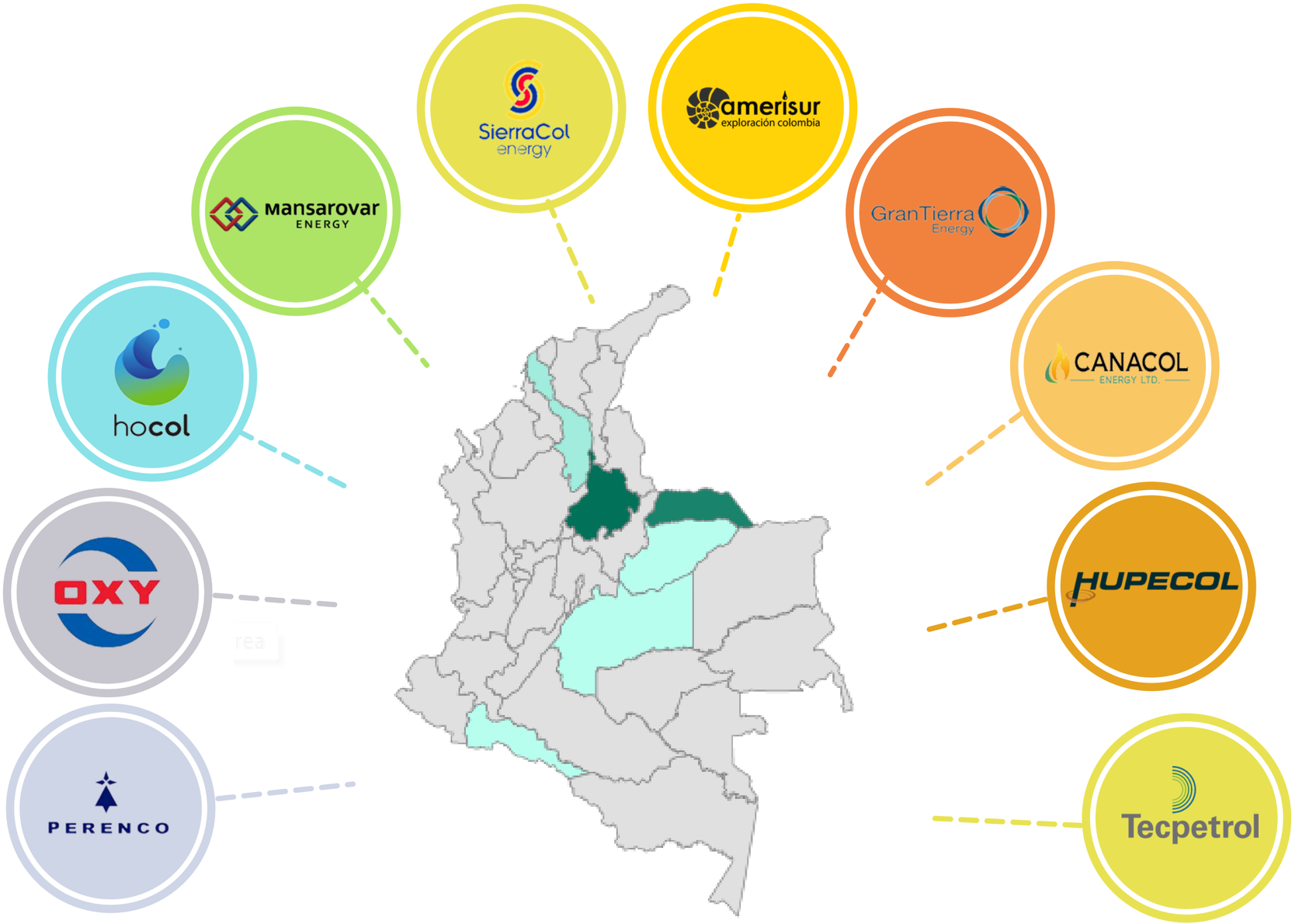
EXPERIENCE



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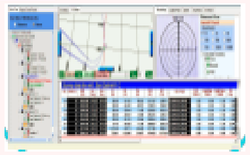
OUR SERVICES

DIRECTIONAL DRILLING SERVICES



- Vertical wells/ Control of verticality
- Directional Wells S & J Type
- Horizontal Wells
- Well planning Software
- TDrag, Hydraulics, BHA Analysis

LOGGING TOOLS & ENGINEERING

- MWD/LWD (Gamma - Res)
- Logging while tripping (LWT)- Density Neutron RES Induction & Propagation, GR
- Gyro Surveying services

DOWNHOLE TOOLS RENTAL

- High performance Downhole Drilling mud Motors.
- MWD/ NMC/ Drilling Jars
- High performance Stabilizers / Reammers

OTHER DIRECTIONAL SERVICES

- Sidetracking/ Re-entrys
- Slant well drilling & BHAs
- HDD Horizontal directional
- Drilling River crossing

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MUD MOTOR

Designed to perform under harsh drilling conditions. The unparalleled strength and robustness of the motor comes from its innovative design which incorporates proprietary elastomers with EvenWall® technology to withstand hostile drilling environments

- Premium hard rubber and EvenWall® design
- Higher temperature ratings
- Chemical resistance
- Improved performance capability
- Increased ROP, reduced NPT
- Consistency, reliability and longevity
- Optimization capabilities

Even Wall® Technology Advantage


SpiroStar™

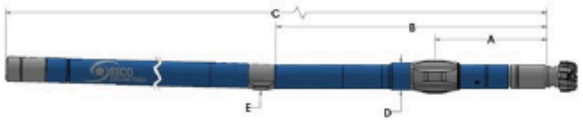

SpiroStar Supreme™

Even Wall® provides a unique uniform rubber thickness that gives unparalleled strength and the ability to withstand harsh environments.

Dynamometer testing has confirmed that SpiroStar Supreme power sections maintain speed and deliver higher torque output compared to other high performance power sections.

IONOS DIRECTIONAL SERVICES

8" SS100, G2 Bearing



Power Section Configuration

Lobes:	7/8	Stages:	4.0

Physical Data

Bit to Center of Stabilizer Blade	A	38.49 in (978mm)
Bit to Bend	B	114.4 in (2,906 mm)
Overall Motor Length	C	31.1 ft (9.5 m)
Max OD of Motor at Stabilizer Upset	D	9.88 in (251 mm)
Radius at Kickpad	E	4.25 in (108 mm)
Max Effective OD of Slick Motor @ Kickpad		8.00 in (203 mm)
Common Top Connection:		6- 5/8" REG
Common Btm Connection:		6- 5/8" REG
Recommended Bit Sizes:		10-5/8" to 12-1/4" (270 - 311 mm)
Estimated Weight		4100 lbs (1860 kg)

Predicted Build Rates– Degrees / 100 ft (30m)

	Slick Motor		Stabilized 1/8" UG		Stabilized 1/4" UG	
	Hole Size (in)		Hole Size (in)		Hole Size (in)	
ABH (°)	9-7/8	12-1/4	9-7/8	12-1/4	9-7/8	12-1/4
0.39	-	-	2.1	3.2	-	2.7
0.78	2.6	-	4.1	4.9	3.8	4.4
1.15	4.7	-	6.7	6.5	6.3	6.0
1.50	6.7	3.6	9.1	8.0	8.8	7.6
1.83	8.5	5.5	11.4	10.3	11.0	9.9
2.12	10.1	7.1	13.4	12.3	13.0	11.9
2.38	11.6	8.5	15.2	14.1	14.8	13.7
2.60	12.8	9.8	16.7	15.6	16.4	15.2
2.77	13.8	10.7	17.9	16.8	17.5	16.4
2.90	14.5	11.5	18.8	17.7	18.4	17.3
2.97	14.9	11.9	19.3	18.2	18.9	17.8
3.00	15.1	12.0	19.5	18.4	19.1	18.0

Maximum Motor Loads

		Continuous Operation	Ultimate Loading
WOB	lbs (kg)	94,800 (43,000)	-
Backreaming	lbs (kg)	48,000 (21,770)	-
Bit Overpull*	lbs (kg)	249,000 (112,940)	925,000 (419,580)
Body Overpull*	lbs (kg)	660,000 (299,370)	1,425,000 (646,380)

* While not Operating

Continuous Loads - Lay motor down if exceeded

Ultimate Loads - Motor parts may be left in hole if load approached

8" SS100, G2 Bearing

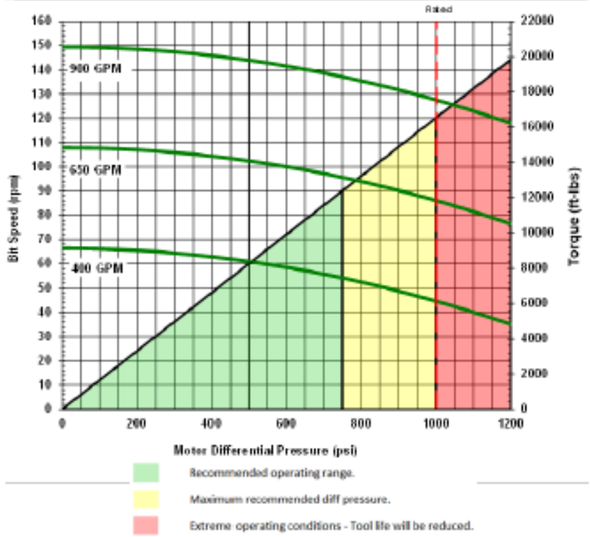
Recommended Operating Limits

Flow Range	400 - 900 gpm (1,514 - 3,407 lpm)
Speed Ratio	.16 rev/gal (.042 rev/l)
No Load Bit Speed	66 - 149 rpm

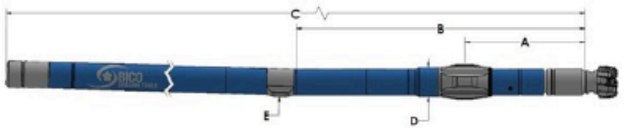
Performance Output

Max Recommended Pressure	1,000 psi (69 bar)
Torque Slope	16.54 ft-lb/psi (325 Nm/bar)
Torque @ Max Recommended Pressure	16,540 ft-lbs (22,425 Nm)
Power @ Max Recommended Pressure	403 hp (301 kW)

Performance Curve



7" SSS100, G2



Power Section Configuration

Lobes:	7/8	Stages:	6.1

Physical Data

Bit to Center of Stabilizer Blade	A	25.5in (648 mm)
Bit to Bend	B	64 in (1,626 mm)
Overall Motor Length	C	35 ft (10.6 m)
Max OD of Motor at Stabilizer Upset	D	7.13 in (181 mm)
Radius at Kickpad	E	3.86 in (98 mm)
Max Effective OD of Slick Motor @ Kickpad		6.91 in (176 mm)
Common Top Connection:		4-1/2" IF
Common Btm Connection:		4-1/2" REG
Recommended Bit Sizes:		8-1/2" to 9-7/8" (215.9 - 251.0 mm)
Estimated Weight		3300 lbs (1225 kg)

Predicted Build Rates– Degrees / 100 ft (30m)

	Slick Motor			Stabilized 1/8" UG			Stabilizerd 1/4" UG		
	Hole Size(in)			Hole Size(in)			Hole Size(in)		
FBH(°)	8-1/2	8-3/4	9-7/8	8-1/2	8-3/4	9-7/8	8-1/2	8-3/4	9-7/8
1.00	4.8	4.2	-	5.6	5.7	6.3	4.9	5.1	5.7
1.15	5.7	5.1	2.4	6.4	6.5	7.1	5.8	5.9	6.5
1.25	6.3	5.7	3.0	7.0	7.1	7.7	6.4	6.4	7.0
1.50	7.8	7.2	4.5	8.7	8.5	9.0	8.1	8.0	8.3
1.75	9.3	8.7	6.0	10.4	10.2	10.3	9.8	9.7	9.7
1.83	9.8	9.2	6.5	10.9	10.8	10.8	10.4	10.2	10.1
2.00	10.8	10.2	7.6	12.1	11.9	11.7	11.5	11.4	11.0
2.12	11.5	11.0	8.3	12.9	12.7	12.3	12.3	12.2	11.6

Maximum Motor Loads

		Continuous Operation	Ultimate Loading
WOB	lbs (kg)	81,000 (36,740)	-
Backreaming	lbs (kg)	56,000 (25,400)	-
Bit Overpull*	lbs (kg)	197,000 (89,360)	740,000 (335,660)
Body Overpull*	lbs (kg)	526,000 (238,590)	1,070,000 (485,340)

*** While not Operating**

Continuous Loads - Lay motor down if exceeded

Ultimate Loads - Motor parts may be left in hole if load approached

7" SSS100, G2

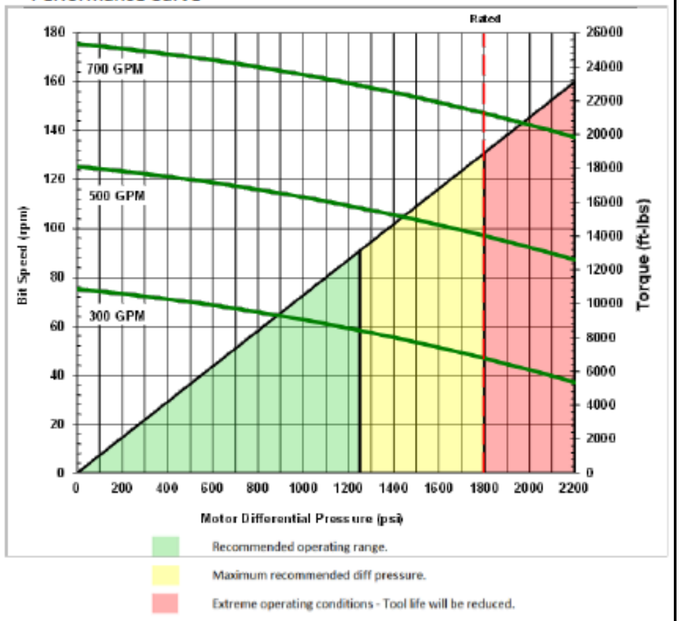
Recommended Operating Limits

Flow Range	300 - 700 gpm (1,135- 2,650
Speed Ratio	.25 rev/gal (.066 rev/l)
No Load Bit Speed	75 - 175 rpm

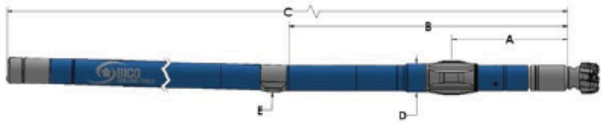
Performance Output

Max Recommended Pressure	1,800 psi (124 bar)
Torque Slope	10.8 ft-lb/psi (212 Nm/bar)
Torque @ Max Recommended Pressure	19,425 ft-lbs (26,338 Nm)
Power @ Max Recommended Pressure	544 hp (406 kW)

Performance Curve



6-3/4" SS100, G2 66



Power Section Configuration

Lobes:	7/8	Stages:	5

Physical Data

Bit to Center of Stabilizer Blade	A	28.2 in (716 mm)
Bit to Bend	B	66.0 in (1,676 mm)
Overall Motor Length	C	29.4 ft (9.0 m)
Max OD of Motor at Stabilizer Upset	D	7.76 in (197 mm)
Radius at Kickpad	E	3.7 in (94 mm)
Max Effective OD of Slick Motor @ Kickpad		7.4 in (188 mm)
Common Top Connection:		4-1/2" REG
Common Btm Connection:		4-1/2" REG
Recommended Bit Sizes:		7-7/8" to 9-7/8" (200.0 - 251.0 mm)
Estimated Weight		2700 lbs (1225 kg)

Predicted Build Rates– Degrees / 100 ft (30m)

	Slick Motor			Stabilized 1/8" UG			Stabilized 1/4" UG		
	Hole Size (in)			Hole Size (in)			Hole Size (in)		
ABH (°)	8-1/2	8-3/4	9-7/8	8-1/2	8-3/4	9-7/8	8-1/2	8-3/4	9-7/8
0.39	-	-	-	2.3	2.4	3.1	-	-	2.4
0.78	3.4	2.9	-	4.3	4.4	5.1	3.7	3.8	4.4
1.15	5.7	5.2	3.1	6.9	6.7	6.9	6.4	6.2	6.3
1.50	7.8	7.4	5.2	9.4	9.3	8.7	8.9	8.8	8.1
1.83	9.9	9.4	7.3	11.8	11.7	11.0	11.3	11.2	10.5
2.12	11.7	11.2	9.1	13.9	13.8	13.2	13.4	13.3	12.6
2.38	13.3	12.8	10.7	15.8	15.7	15.1	15.3	15.2	14.5
2.60	14.6	14.2	12.0	17.4	17.3	16.7	16.9	16.8	16.1
2.77	15.7	15.2	13.1	18.7	18.5	17.9	18.2	18.0	17.4
2.90	16.5	16.0	13.9	19.6	19.5	18.8	19.1	19.0	18.3
2.97	16.9	16.5	14.3	20.1	20.0	19.4	19.6	19.5	18.8
3.00	17.1	16.6	14.5	20.4	20.2	19.6	19.8	19.7	19.1

Maximum Motor Loads

		Continuous Operation	Ultimate Loading
WOB	lbs (kg)	81,000 (36,740)	-
Backreaming	lbs (kg)	56,000 (25,400)	-
Bit Overpull*	lbs (kg)	197,000 (89,360)	740,000 (335,660)
Body Overpull*	lbs (kg)	526,000 (238,590)	1,070,000 (485,340)

*** While not Operating**

Continuous Loads - Lay motor down if exceeded

Ultimate Loads - Motor parts may be left in hole if load approached

6-3/4" SS100, G2 66

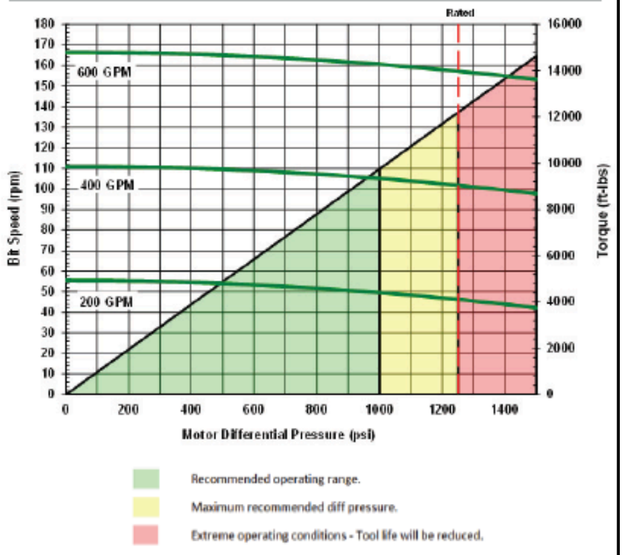
Recommended Operating Limits

Flow Range	200 - 600 gpm (760 - 2,270
Speed Ratio	.28 rev/gal (.074 rev/l)
No Load Bit Speed	55 - 166 rpm

Performance Output

Max Recommended Pressure	1,250 psi (86 bar)
Torque Slope	9.75 ft-lb/psi (192 Nm/bar)
Torque @ Max Recommended Pressure	12,188 ft-lbs (16,525 Nm)
Power @ Max Recommended Pressure	364 hp (271 kW)

Performance Curve



PP-MWD

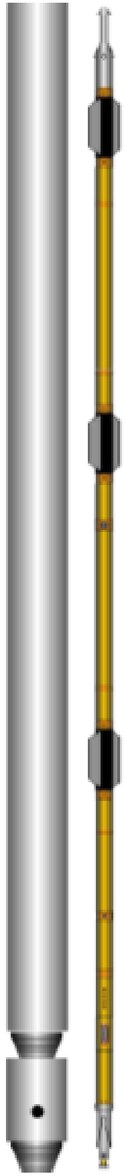
- The positive pulse measurement while drilling system (PP-MWD) principle is based on the temporary restriction of drillstring mud flow to create a series of pressure spikes that form a communicative pulse waveform that is decoded using surface equipment. Downhole configurations are fully modular adding the flexibility of adjustments specific to BHA. Reliable surface decoding is further enhanced with the added option of wireless system for long-range communication between rig and command center. Quality sensor measurement is made possible through industry standard magnetometer and acelerometer packages, including API standardized gamma ray modules. Downhole tool is fully retrievable and reinsertable for added confidence in lost in hole situations. PP-MWD applications are available with the optional rotary flow switch (RFS) thet can significantly improve run durations and reduce unnecesary pulser operation by switching tool into standby mode under rotation.

APPLICATION

- Directional, Vertical, Horizontal and re-entry wells.
- Short radius slimhole applications (3.5in tools)
- Logging While Drilling (LWD), gamma, vibration.

FEATURES AND BENEFITS

- High operating temperature (175°C) and pressure (20.000psi)
- Wire line retrievable and reinsertable design (Minimum 2.25in I.D)
- Available real-time gamma measurements for LWD (focus gamma available) Downlink capability for selectable operating modes proven software and firmware for efficient decoding.
- Adaptable tool configurations and programming flexibility.
- Long battery life with Rotary Flow Switch (RFS) option Reliable, proven rugged design mud telemetry not affected by formation or drilling fluid resistivity.



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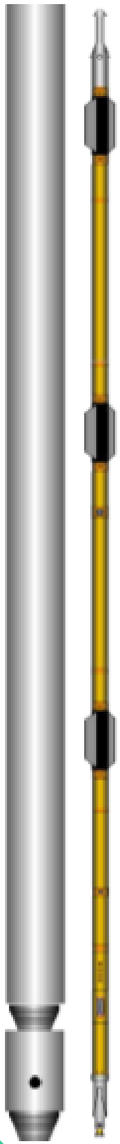
MUD PULSE SPECIFICATION SHEET



DESCRIPTION	SPECIFICATIONS
Data Transmission Type	Positive Mud Pulse
Collar Sizes	89mm-203mm (3.50in-8.00in) Additional sizes available
Operating Flow Rate	0.28-4.54m³/min (75-1200gpm)
Wireline Retrievability	Retrievable and Reinsertable
Minimum ID for Retrievability	57mm (2.25in)
Flow Switch	Vibration
Nominal Length	9.75m (32ft), 11.88m (39ft) w/gamma
Housing O.D.	47.625mm (1.875in)
Power Supply	Lithium 28VDC/3amp (21VDC/5amp available)
Shock Limit	1000g, 0.5msec, ½ sine all axes
Vibration Limit	5-30Hz@1in double amplitude, 30-500Hz 20g all axes
Operating Temperature (max)	150°C (302°F), 175°C (347°F) available
Hydrostatic Pressure (max)	137,895kPa (20,000psi)
Pressure Drop (6.50in w/Water)	689kPa@1.51m³/min (100psi@400gpm)
Hydrostatic Pressure (max)	137,895kPa (20,000psi)
Pressure Drop (6.50in w/Water)	689kPa@1.51m³/min (100psi@400gpm)
Velocity Rate (max)	10m/sec (32ft/sec)
Bend Radius (max)	20deg/10m
LCM Tolerance (max)	40-50ppb concentration, any size, premixed
Operating Pulse Width	0.600-2.00sec
Data Update Rate	10-28sec
Survey Transmission Rate	<120sec (resolution and pulse width dependent)
Toolface Accuracy	0-360° +/- 0.50°
Inclination Accuracy	0-180° +/- 0.10°
Azimuth Accuracy	0-360° +/- 0.25°
Survey Procedure	Rotary OFF → Pumps OFF→ Hold 60sec → Pumps ON → Survey Sequence Received → Steering Sequence Received
Operational Modes	Operator-selectable survey and steering sequences, resolution and pulse width settings

Hydrostatic Pressure (max)	137,895kPa (20,000psi)
Pressure Drop (6.50in w/Water)	689kPa@1.51m³/min (100psi@400gpm)
Velocity Rate (max)	10m/sec (32ft/sec)
Bend Radius (max)	20deg/10m
LCM Tolerance (max)	40-50ppb concentration, any size, premixed
Operating Pulse Width	0.600-2.00sec
Data Update Rate	10-28sec
Survey Transmission Rate	<120sec (resolution and pulse width dependent)
Toolface Accuracy	0-360° +/- 0.50°
Inclination Accuracy	0-180° +/- 0.10°
Azimuth Accuracy	0-360° +/- 0.25°
Survey Procedure	Rotary OFF → Pumps OFF→ Hold 60sec → Pumps ON → Survey Sequence Received → Steering Sequence Received
Operational Modes	Operator-selectable survey and steering sequences, resolution and pulse width settings

Operational Modes	Operator-selectable survey and steering sequences, resolution and pulse width settings
Downlink Capability	Pumps ON/OFF sequences for mode-selection, steering and survey sequences, and pulse width settings
BHA Configuration	UBHO - NMDC - NMDC
BHA Landing	Bottom Landing
Tool Configuration (Standard)	Pulser - $Battery_{(1)}$ - Directional Module - $Battery_{(2)}$
Tool Configuration (Gamma)	Pulser - Gamma - Directional Module - $Battery_{(2)}$ - $Battery_{(1)}$
Rotary Power Save Mode	Yes (RFS available)
Battery Consumption	220-320hrs (medium-rate dual battery), 180-260hrs (medium-rate dual battery w/gamma). Consumption factors include resolution and pulse width settings

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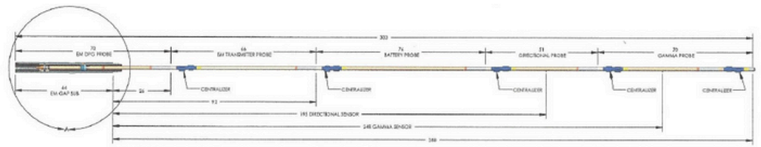
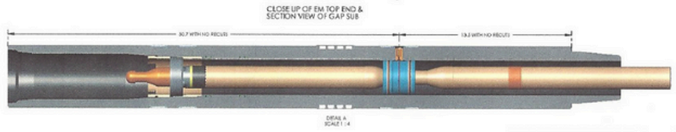
HIGH VOLTAGE XEM SYSTEM

The XEM is an electromagnetic (EM) telemetry system offering Inclination /Azimuth, full MWD, Gamma-ray logging, and Borehole / Annular Pressure While Drilling (PWD).
Additional aspects of the XEM tool are listed below:

- XEM is capable of high data rates.
- XEM can be used for Survey On Command (SOC) applications.
- XEM requires no mechanical adjustments associated with a Pulser or extensions.
- Upon arrival to the job location, the tool needs only to be built, programmed, and loaded into the BHA.
- XEM is non-retrievable.
- XEM basic services are Directional Survey Service (DSS), Directional Logging Service (DLS), and other possible services include Perform Drilling Mechanics.
- XEM has no LCM restrictions.
- XEM can operate up to 300°F.
- XEM signal strength is limited by depth, formation resistivity, and electrical noise factors.
- XEM does not transmit when no vibration is detected, which saves battery life.
- XEM can incorporate programmable frames.
- XEM can have different configurations downlinked to it.



NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. DISTANCE MEASUREMENTS ARE TYPICAL FOR BOTH 4-3/4" AND 6-1/2" TOOL STRINGS.
3. TO ADJUST FOR GAP SUB RECUTS, MEASURE THE DISTANCE FROM THE CENTRE OF THE SIDE POST TO THE GIVEN SHOULDER AND COMPARE WITH THE UNCUT DISTANCES SHOWN BELOW.
4. IF A SECOND BATTERY IS DESIRED, THEN PLACE IT BETWEEN THE DIRECTIONAL PROBE AND GAMMA PROBE, AND ADD 76 INCHES TO THE GAMMA LOCATIONS



Description	Ø4.75"	Ø6.50"	Ø8.00"
Gap Sub ID	2.688±0.005"	2.813±0.005"	3.500±0.002"
Gap Sub OD	4.750±0.025"	6.500±0.025"	8.000±0.025"
OD With Hard Banding	4.825±0.025"	6.575±0.025"	No Hard Banding
Available End Connections	NC 38 (3-1/2 IF)	NC 46 (4-1/2 XH)	6-5/8 Regular
Connection Makeup Torque	9,400 *ft.lbs*	23,000 *ft.lbs*	39,000 *ft.lbs*
Rotation	Up to 200 *RPM*, 20-80 *RPM* Typical		
Shock	1000 g, ½ msec, ½ Sine Shock		
Vibration	30 *g*, 30 – 500 *Hz*		
Max. Operating Pressure	15,000 *psi*		
Max. Operating Temperature	150°C (300°F)		
Min. Storage/Transportation Temperature	-40°C (-40°F)		
Max. Sand Content by Volume	2%		
Max. LCM Content	No Limits		
Max. Axial Load	100,000 *lbs* Compression	200,000 *lbs* Compression	300,000 *lbs* Compression
	500,000 *lbs* Tension	1,000,000 *lbs* Tension	1,200,000 *lbs* Tension
Torsional Strength of Gap at 150°C	10,000 *ft.lbs*	20,000 *ft.lbs*	55,000 *ft.lbs*
Gap Sub Overall Length	44.2"		
Gap Sub Re-Cut Length	6.50" Pin End & 4.75" Box End		5.50" Pin End & 4.75" Box End
Max. Dog Leg Severity Rotating	15°/30*m* - Slick Collars	10°/30*m* - Slick Collars	8°/30*m* - Slick Collars
	25°/30*m* - Flex Collars	15°/30*m* -Flex Collars	13°/30*m* -Flex Collars
Flex Collar Requirements****	Ø4.00" Flex Section Min. 2/3 Total Length (20' of 31') Collars Above and Below Gap Sub	Ø5.625" Flex Section Min. 2/3 Total Length (20' of 31') Collars Above and Below Gap Sub	Ø6.00" Flex Section Min. 2/3 Total Length (12.4' of 31') Collars Above and Below Gap Sub
Recommended Max. Flow Rate	1.2 m^3/*min* (317 *GPM*)	2.0 m^3/*min* (528 *GPM*)	4.0 m^3/*min* (1056 *GPM*) (1) 3.4 m^3/*min* (900 *GPM*) (2)
Recommended Collar Bore(s)	2-11/16" ID Collar	2-13/16" ID Collar	3-1/2" ID Collar (1) 3-1/4" ID Collar (2)
Drilling Fluid	Water Based Mud/Oil Based Mud/Air		
Electrical Resistance	> 1 *kΩ* typ.		
Tool Length (Probe Dependent)	Min. 235" & Max. 365"		
Max. Tool Weight (w/o collar)	270 *lb*	430 *lb*	610 *lb*

****Contact Extreme Engineering for maximum dogleg severity if a different size flex collar is to be used
(1) Collar ID 3-1/2"
(2) Collar ID 3-1/4"

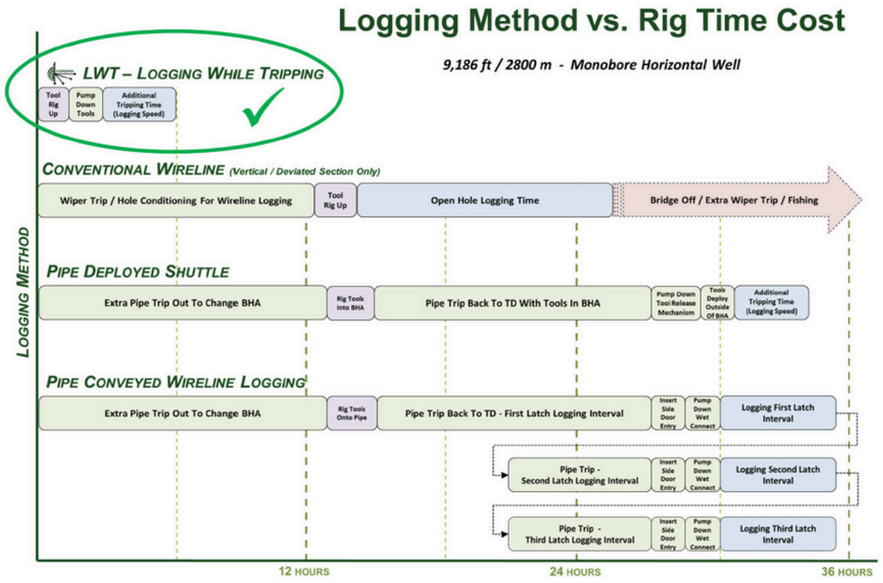
Description	Ø4.75"	Ø6.50"	Ø8.00"
Gap Sub ID	2.688±0.005"	2.813±0.005"	3.500±0.002"
Gap Sub OD	4.750±0.025"	6.500±0.025"	8.000±0.025"
OD With Hard Banding	4.825±0.025"	6.575±0.025"	No Hard Banding
Available End Connections	NC 38 (3-1/2 IF)	NC 46 (4-1/2 XH)	6-5/8 Regular
Connection Makeup Torque	9,400 *ft.lbs*	23,000 *ft.lbs*	39,000 *ft.lbs*
Rotation	Up to 200 *RPM*, 20-80 *RPM* Typical		
Shock	1000 g, ½ msec, ½ Sine Shock		
Vibration	30 *g*, 30 – 500 *Hz*		
Max. Operating Pressure	15,000 *psi*		
Max. Operating Temperature	150°C (300°F)		
Min. Storage/Transportation Temperature	-40°C (-40°F)		
Max. Sand Content by Volume	2%		
Max. LCM Content	No Limits		
Max. Axial Load	100,000 *lbs* Compression	200,000 *lbs* Compression	300,000 *lbs* Compression
	500,000 *lbs* Tension	1,000,000 *lbs* Tension	1,200,000 *lbs* Tension
Torsional Strength of Gap at 150°C	10,000 *ft.lbs*	20,000 *ft.lbs*	55,000 *ft.lbs*
Gap Sub Overall Length	44.2"		
Gap Sub Re-Cut Length	6.50" Pin End & 4.75" Box End		5.50" Pin End & 4.75" Box End
Max. Dog Leg Severity Rotating	15°/30*m* - Slick Collars	10°/30*m* - Slick Collars	8°/30*m* - Slick Collars
	25°/30*m* - Flex Collars	15°/30*m* -Flex Collars	13°/30*m* -Flex Collars
Flex Collar Requirements****	Ø4.00" Flex Section Min. 2/3 Total Length (20' of 31') Collars Above and Below Gap Sub	Ø5.625" Flex Section Min. 2/3 Total Length (20' of 31') Collars Above and Below Gap Sub	Ø6.00" Flex Section Min. 2/3 Total Length (12.4' of 31') Collars Above and Below Gap Sub
Recommended Max. Flow Rate	1.2 m^3/*min* (317 *GPM*)	2.0 m^3/*min* (528 *GPM*)	4.0 m^3/*min* (1056 *GPM*) (1) 3.4 m^3/*min* (900 *GPM*) (2)
Recommended Collar Bore(s)	2-11/16" ID Collar	2-13/16" ID Collar	3-1/2" ID Collar (1) 3-1/4" ID Collar (2)
Drilling Fluid	Water Based Mud/Oil Based Mud/Air		
Electrical Resistance	> 1 *kΩ* typ.		
Tool Length (Probe Dependent)	Min. 235" & Max. 365"		
Max. Tool Weight (w/o collar)	270 *lb*	430 *lb*	610 *lb*

****Contact Extreme Engineering for maximum dogleg severity if a different size flex collar is to be used
(1) Collar ID 3-1/2"
(2) Collar ID 3-1/4"

IONOS
DIRECTIONAL SERVICES

LOGGING WHILE TRIPPING

- LWT is a patented logging technique in which memory based openhole logs are acquired in a method that is more cost effective, uses less rig time, and has fewer inherent risks than wireline, shuttle (thru-the-bit), or logging while drilling (LWD) methods. LWD allows openhole logs to be acquired in vertical, deviated, horizontal and tough logging condition wells where logging was previously considered too risky or uneconomic.
- LWT is a commercially proven, propietary formation evaluation technique. Immediately after drilling has been completed, the LWT tools are deployed and wireline quality openhole logs are acquired in memory from within LWT collars positioned in the drill string during the trip to surface. The LWT suite of logging tools include:
  - Gamma Ray (GR)
  - Spectral Gamma (SGR)
  - Compensated Neutron (CN)
  - Density (DEN)
  - Dual Induction (DUIN)
- LWT Logging devices are API calibrated and meet all requirements for porosity and resistivity measurements.
- The LWT collars, inserted into the drill string on the last bit trip, or on the planned reamer run, do not require any change in drilling plans or extra rig time to change to a specialized BHA. LWT tools are deployed (pumped down) when TD is reached and log unterthered in memory during the normal pipe trip out of the hole. Data is downloaded from tools at surface and logs delivered to client. virtually no additional rig time is required for logging.



CLICK HERE

Interactive video

IONOS DIRECTIONAL SERVICES

LOGGING WHILE TRIPPING

No change in drilling programs or extra rig time to change to a specialized BHA is required.

Drill

LWT "empty" collars are inserted into the drill string on the last bit trip

Deploy

Once drilling BHA is at TD, Rig-up and Pump-down the LWT logging tools

The only **marginal** extra time required for the LWT operation

Logging while Tripping out the drillpipe with no extra time.

Log

While Tripping out of the Hole

Deliver

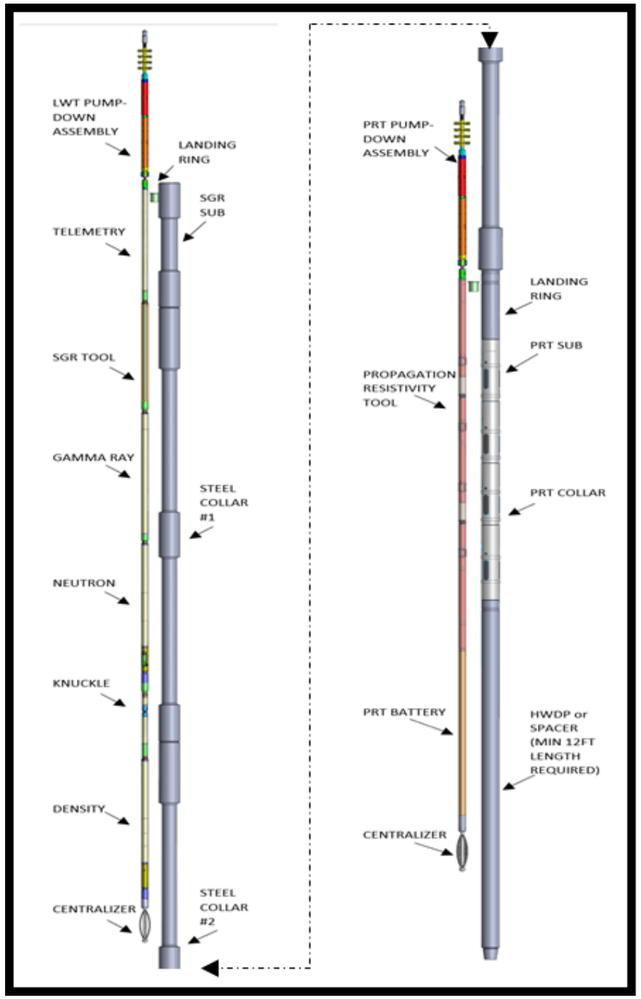
Wireline Quality Data

Qualified data against all major service providers in both Wireline and LWD.

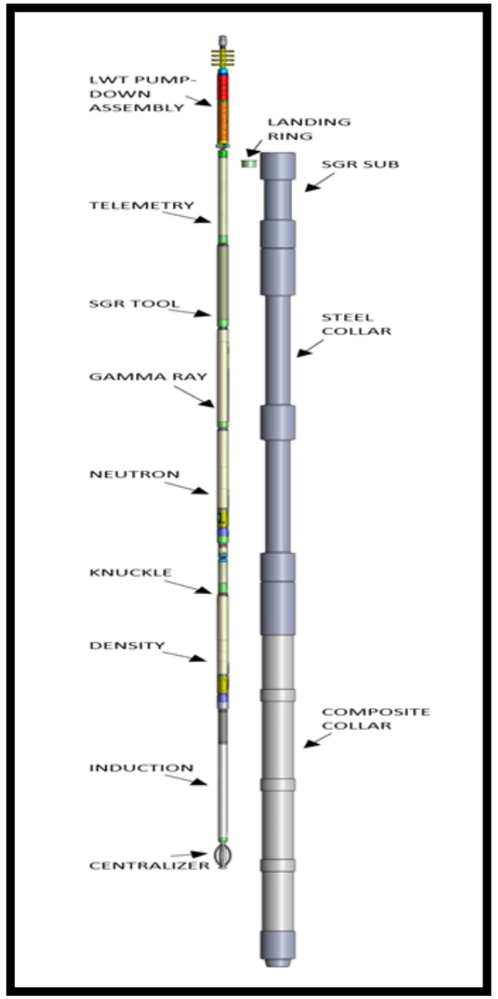
IONOS DIRECTIONAL SERVICES

LOGGING WHILE TRIPPING-CONFIGURATIONS

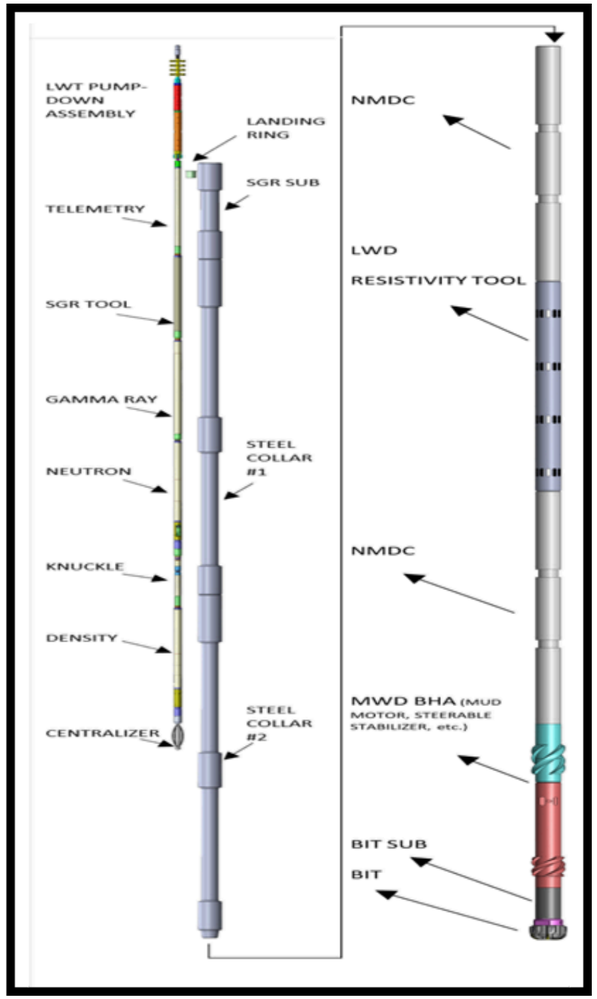
LWT RES-P + DEN + NEU-GR + SGR



LWT RES-I + DEN + NEU-GR + SGR



LWT DEN+NEU-GR+SGR+ (LWD RES-P)



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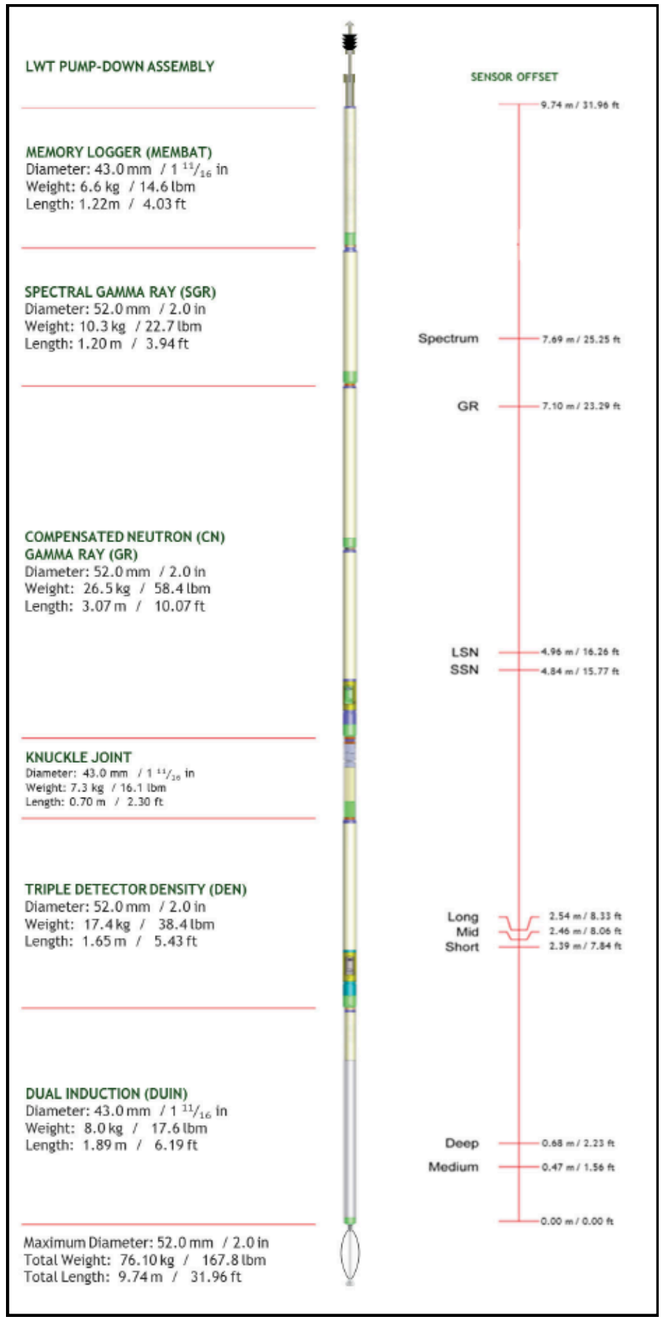
LOGGING WHILE TRIPPING-SPEC SHEET



LWT Collar Working Limitations						
LWT Collar	3.5 - in IF (4.75 - in. OD)	XT 39 (5 - IN. OD)	4 - in FH (5- in. OD)	4 - in FH (5.25-in OD)	4.5-in XH (6.375-in. OD)	4.5-in IF (6.75-in. OD)
Makeup Torque (ft-lbf)	9100	10800	10800	10800	17000	18900
Max Drilling/Reaming Torque (ft-lbf)	12000	18000	18000	20000	24000	26400
Max Tension (lbm)	200000	290000	290000	330000	400000	440000
Max Compression (lbm)	4000	180000	180000	229000	240000	264000
Max Pressure (psi)	5600/38610	5000	5000	5000	5000	5000
Brust Pressure (psi/Kpa)	5600/38610	7000/48263	7000/48263	7700/53089	7000/48263	7000/48263
Collar Only (no Logging tools landed)						
Max Flow Rate (gal/min m3/min)	396/1.5	396/1.5	396/1.5	396/1.5	528*/660* 2.0*/2.5**	396/1.5
Max Rotation (rpm)	80	80	80	80	80	80
Logging Tools Landed in collar						
Max Flow Rate (gal/min m3/min)	198/0.75	198/0.75	198/0.75	198/0.75	264*/396* 1.0*/1.5**	396/1.5
Max Rotation (rpm)	40/25(w/DUIN)	40/25(w/DUIN)	40/25(w/DUIN)	40/25(w/DUIN)	40/25(w/DUIN)	40/25(w/DUIN)
Logging Speed (fl/min / m/min)						
w/o SGR Open Hole	36/11	36/11	36/11	36/11	36/11.6	36/11
w/SGR (>30GAPI) Open Hole	23/7	23/7	23/7	23/7	23/7	23/7
w/SGR (<30GAPI) Open Hole	10/3	10/3	10/3	10/3	10/3	10/3
Casing	36/11	36/11	36/11	36/11	36/11	36/11

LWT Collar Dimensions				
Collar Type	OD (in/mm)	ID (in/mm)	Length (ft/m)	Weight (lbm/Kg)
3,5 in IF Steel	4,75/120	2,5/63,5	15,5/4,7	500/227
3,5 in IF Steel Composite	4,75/120	2,5/63,5	17,6/5,36	300/136
XT39 Steel	5/127	2,67/67,8	15,5/4,72	500/227
XT39 Composite	5/127	2,67/67,8	17,6/5,36	345/156
4in FH Steel	5/127	2,67/67,8	15,5/4,72	535/243
4in FH Composite	5/127	2,67/67,8	17,6/5,36	345/156
4in FH Composite	5,25/133	2,69/68,3	17,6/5,36	370/168
4,5 XH Steel	6,375/162	3/76,2	15,5/4,72	765/347
4,5 in XH Composite	6,375/162	3/76,2	17,6/5,36	535/243
4,5 in IF Steel	6,75/172	3/76,2	15,5/4,72	920/417
4,5 in IF Composite	6,75/172	3/76,2	17,6/5,36	640/290

IONOS DIRECTIONAL SERVICES

LOGGING WHILE TRIPPING-SPEC SHEET

LWT Tool Specifications					
LWT Tool	Dual induction (DUIN)	Triple detector Density (DEN)	Compensated Neutron & Gamma Ray	Spectral Gamma Ray (SGR)	Memory Logger (MEMBAT)
Wheight (Lbm/Kg)	17,6/8,0	38,4/17,4	58,4/26,5	22,7/10,3	14,6/6,6
Length (ft/m)	6,19/1,89	5,43/1,65	3,07/10,07	3,94/1,2	4/1,22
Outside Diameter (in/m	1 11/16 / 43	2,0/52,0	2/52	2/52	1 11/16 / 43
Max Temp (ºF/ºC)	300/15	300/150	300/150	300/150	300/150
Max Pressure (Psi/Mpa	14000/100	14000/100	1400/100	14000/100	14000/100

LWT Logging Parameters				
LWT Tool	Dual Induction (DUIN)	Triple Detector Densiity (DEN)	Compensated Neutron & Gamma Ray (CN &GR)	Spectral Gamma Ray (SGR)
Max Loggins Speed (ft/min / m/min)	36/11	36/11	36/11	23 (> 30 GAPI) 10 (< 30 GAPI)
Sample Rate	1 sample/sec	1 sample/sec	1 sample/sec	1 sample/sec
Depth of investigation Rt/Rm=10 (in / m)	Deep: 51 / 1,3 Medium: 25,6 / 0,65	3,9 / 100	CN: 10/260 at 20 PU	11,8/300
Vertical Resolution Rt/Rm=10 (in / m)	Deep: 51 / 1,3 Medium: 25,6 / 0,65	17,6 / 448	22,4 / 570	5,9 / 150
Min Hole Size (in / mm)	4,9 / 125	4,9 / 125	4,9 / 125	4,9 / 125
Max Hole Size (in / mm)	9,8 /250	9,8 / 250	9,8 / 250	9,8 / 250
Measurement Range	Resistivity 0,5-2000 ohm-m	Bulk Density: 1-3 g/cm3	Porosity: 0-60% GR: 0-400 API	GR: 0-3000 API K: 0-100% U: 0-1,000ppm Th:0-1,000ppm
Accurancy	Max Error: 5% (at 0,5 phm-m)	Bulk Density: +- 0,05 g/cm3	Porosity: 0-10 PU: PU +/- 0,5 PU 10-30 PU: +/- 8% 30-60PU PU: +/- 10% GR: +/- 2% measured values	GR, K +/- 2% measured values U, Th +/- 3% measured values

OPERATIONAL CONSIDERATIONS

Drifting the Pipe

- The minimum pipe ID for LWT for deployment is 2,21 in (56mm)
- The entire BHA must be drifted prior to running LWT Tools.
- There are two ways to drift.
  - Upon reaching TD/ICP, The rig pumps down drift, trips out and retrieves drift once on surface.
  - Drift every stand in the derrick while running in hole.

Strapping The Pipe

- An exact pipe tally is required for depth control.
- The pipe tally is compared to the electronic Driller Recorder (ERD) for depth measurement correction during tripping.

BHA Configuration

- The LWT Collars are rigged up as close to the bit as possible based on BHA components
- All BHA configurations are reviewed prior to job.
- Ionos Does not recommended the use of jars with LWT collars and tools.
- A float is required in the BHA during logging operations.

IONOS
DIRECTIONAL SERVICES

FIXEDBLADE STABILIZER

OVERVIEW

The Fixedblade® was designed to address the known shortcomings of the conventional spiral blade stabilizer. Simple yet innovative solution enhances drill-ing performance, prevents downhole failures and makes tripping easier.

Design Feature

- Dome-shaped, low friction blades
- 6 points of contact with the 5-3/4" and 14-1/2" hole sizes
- 8 points of contact with the 16-1/2" and 26" hole sizes
- Flow profile with optimized hydrodynamics Benefits
- Reduced torque and drag
- Improved weight transfer and tool face control when slide drilling
- BHA vibration dampening
- Increased stability
- Resistance to balling up and packing off
- Reduced risk of swab and surge
- Minimized damage to mud cake while drilling and tripping

Blade Diameter	Length (m / Inch)	Weight (Kgs / lbs)	ID	Fishing Neck Dia.	Surface Area (in^2)	Conn.	TFA%
5-1/2" - 6"	2.00 / 78	180 / 397	2"	4-3/4"	100	NC38	25%
8-1/4"	2.20 / 86	360 / 794	2-1/4"	6-3/4"	220	4-1/2" IF	25%
12"	2.40 / 94	660 / 1,455	2-13/16"	8-1/4"	240	6-5/8" Reg	20%
12"	2.40 / 94	853 / 1,880	3"	9-1/2"	222	7-5/8" Reg	20%
14-1/4"	2.20 / 86	882 / 1,944	3"	9-1/2"	376	7-5/8" Reg	27%
15-3/4"	2.60 / 102	1.158 / 2,553	3"	9-1/2"	404	7-5/8" Reg	26%
16-1/4"	2.50 / 98	1.115 / 2,458	3"	9-1/2"	416	7-5/8" Reg	31%
17-1/4"	2.60 / 102	1.200 / 2,645	3"	9-1/2"	340	7-5/8" Reg	33%
17-7/8"	2.60 / 102	1.246 / 2,747	3"	9-1/2"	352	7-5/8" Reg	39%
25-3/4"	3.30 / 129	2.248 / 4,956	3"	9-1/2"	400	7-5/8" Reg	38%

- Tungsten Carbide hardfacing, optional Thermally Stable Polycrystalline (TSP) inserts also available.
- Other gauge sizes, neck diameters, and/or connectors are available upon request.

IONOS
DIRECTIONAL SERVICES

FIXEDBLADE REAMER

Description:

The Fixedblade Reamer (FBR) is engineered to achieve optimal borehole gauge while effec-tively minimizing borehole tortuosity. This is achieved through the controlled elongation of micro doglegs and borehole spiral patterns during the drilling process. To maximize its effi-ciency, the FBR should be positioned high-up in the drill string and operated under tension.

Design features:

•The FBR boasts an advanced design featuring optimized hydrodynamics, enablingenhanced transportation of cuttings surrounding the stabilizers.

•The cutter configuration allows for forward and back-reaming capabilities.

Benefits

The application of the Fixedblade Reamer yields a multitude of benefits, including:

•Enhanced Weight Transfer and Wellbore Conditions: The tool significantly improved weighttransfer efficiency and optimized the overall wellbore condition.

•Reduced Need for Dedicated Wiper Trips: Minimizes the necessity for separate wiper trips,streamlining the drilling process.

•Decreased Back Reaming and Reduced Stuck Pipe Risk: Effectively reduces the occurrenceof back reaming and minimizes the potential for stuck pipe events.

•Mitigate Balling-Up and Downhole ECD/Swab & Surge Effects: Minimizes instances ofcuttings accumulations (balling), subsequently lowering downhole ECD and swab & surgeeffects.

•Ledges and Pinch Points: The tool aids in the removal of formation ledges and pinch points,contributing to a smooth casing run.

Hole Size	Gauge Range	Length(m)	Weight (kg)	ID	Fishing Neck Dia.	Surf. Area (in^2)	Conn.
6" series	5 3/4" – 6 1/4"	2.00	180	2"	4 3/4"	100	NC38
8" series	8"– 8 1/2"	2.20	360	2 1/4"	6 3/4"	220	4 1/2" IF
12" series	12" – 12 1/4"	2.40	660	2 13/16"	8 1/4"	240	6 5/8" Reg
17" series	14 3/4" - 17 1/4"	2.60	1200	3"	9 1/2"	340	7 5/8" Reg

- Dome inserts made of Tungsten Carbide and Passive Polycrystalline diamond inserts are utilized.
- Different gauge sizes can be provided upon request.

IONOS
DIRECTIONAL SERVICES

DOME HYBRID REAMER

Overview

Uniting Stability and Reaming Precision.

An innovative solution that seamlessly transitions between a stabilizer and a reamer during drilling operations. Designed to complement the Fixedblade Stabilizer, the DHR offers an ex-tended blade length, housing a distinctive 3-stage taper equipped with diverse cutter types.

This unique design ensures a gradual cutting action, commencing at a 20-degree angle at the base, tapering to 14 degrees in the middle, and finally transitioning to a 6-degree angle near the hardfacing. Positioned strategically along each stage are numerous Tungsten Carbide In-serts (TCIs). Additionally, both sides feature varied stud PDC cutters, enhancing reaming capa-bilities. This tool is ideally situated as the top stabilizer, offering top BHA protection. The "passive" design ensures efficient backreaming capacity while maintaining gentle interaction with the wellbore, minimizing torque and potential interference with weight and energy transfer to the bit.

Design Features & Benefits

- Passive functionality within gauge hole during drilling operations.
- Mitigates back reaming and diminishes stuck pipe risks.
- Facilitates smoother casing runs to TD.
- Supports both uni- and bi-directional reaming actions.
- Incorporates a hydrodynamic profile for enhanced fluid and cuttings transportation.
- Elongates micro doglegs and borehole spiral patterns.
- Distinctive 3-stage taper design.
- Enhanced weight transfer and torque efficiency compared to conventional reamers.

Specifications

Series Size	Gauge Range	Length (m)	Weight (kg)	ID	Fishing Neck Dia.	Surface Area (in^2)	Conn.
6" Series	5-3/4"	2.00	180	2"	4 3/4"	100	NC38
8" Series	8-1/4"	2.30	360	2 1/4"	6 3/4"	220	4 1/2" IF
12" Series	12"	2.40	660	2 13/16"	8 1/4"	240	6 5/8" Reg
16" Series	15-3/4"	2.80	1000	3"	9 1/2"	320	7 5/8" Reg
17" Series	17-1/4"	2.80	1200	3"	9 1/2"	340	7 5/8" Reg

* Other gauge sizes are available upon request

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