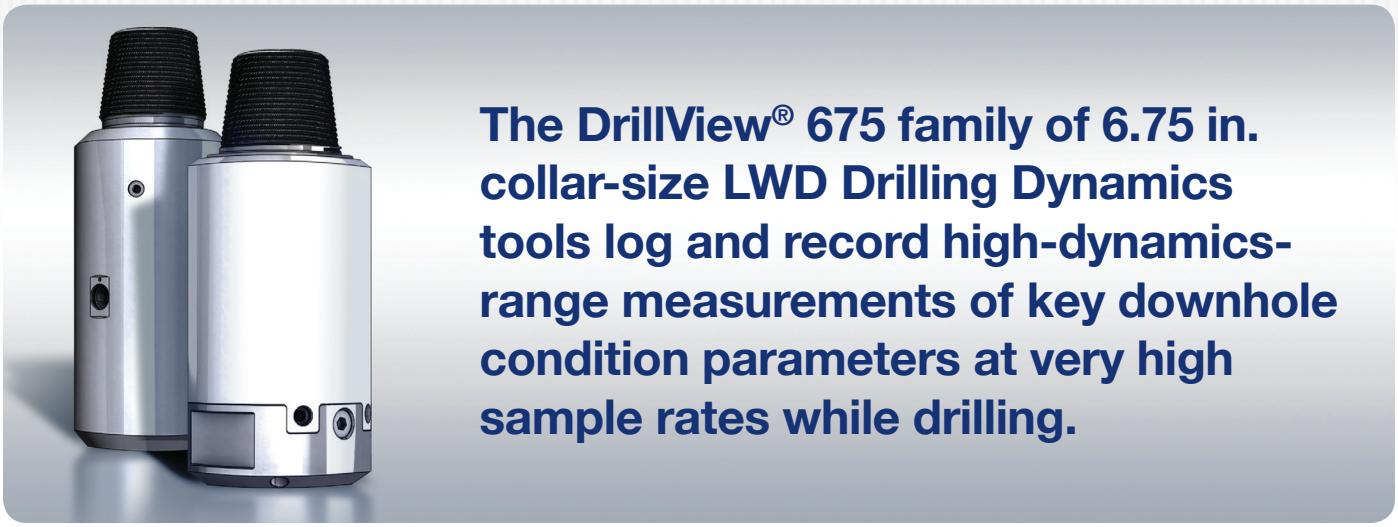
DrillView® 675 LWD Drilling Dynamics Family

PetroMar
A NABORS COMPANY



The DrillView® 675 family of 6.75 in. collar-size LWD Drilling Dynamics tools log and record high-dynamics-range measurements of key downhole condition parameters at very high sample rates while drilling.

The DX, BX and EX models all provide high performance acquisition of wideband tri-axial vibration, shock, acceleration and orientation (gyro, magnetometer, accelerometer) from which high-resolution RPM and instantaneous collar motion trajectory within the borehole are derived. To that functionality, the BX model adds weight-on-bit (WOB), torque-on-bit (TOB) and bend-on-bit (BOB) force measurements. The EX model further adds precision monitoring of bore and annular pressures.

Multiple DrillView® tools (including different tool models) can be deployed simultaneously, configured for at-bit and/or in-string operation to monitor conditions at various points in the BHA and the drillstring. DrillView® tools are currently offered by PetroMar: A Nabors Company via “Service-Company Agnostic” standalone battery/memory operation. If required, PetroMar can also work with MWD/EM telemetry providers to support real-time (RT) data transmission. All DrillView® tool models are offered as bit-subs which can also be configured for in-string operation.

ANSWER PRODUCTS

- Raw Accelerometer Sensor Data (3-axis + Θ)
- Vibration and Shock Statistics, Vibration Spectral Distribution
- Instantaneous Tool Motion Trajectory (Mag/Gyro/Accel-based)
- Instantaneous RPM and Azimuth
- Real Time Clock and Internal Diagnostics
- Temperature
- WOB/TOB/BOB (BX and EX models)
- Annular and Bore Pressures (EX model)

FEATURES

- Industry-leading sample rates up to 20 kHz
- Bit-sub length 12.75 in. (shoulder-to-shoulder)
- User-configurable acquisition modes, filters, and sampling rates
- 32 GB of memory for data storage
- Processing yields stick-slip and whirl detection
- Provisions for condition-based data transmission based on vibration level, shock level, stick-slip, whirl or appearance of certain spectral components (when integrated with RT telemetry)
- Novel wireless tool communication for setup at wellsite
- High-speed data readout (80 Mbps throughput)

APPLICATIONS

- Single-point/multi-point assessment and optimization of drilling performance
- Platform for Mechanical Specific Energy (MSE) and rock properties/geomechanics analytics
- Evaluation of new tools or BHA configurations
- Optimization of BHA design and drilling methods
- Verification of drilling models
- Bit vibration and condition-based maintenance
- Reduction of tool wear and LIH (when integrated with real-time telemetry)

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DrillView® BX and EX

DrillView® DX

DrillView® Tool Configurations

MEASUREMENT SUITE	MEASUREMENT INCLUDED
A - Drillstring Dynamics and Auxiliary Measurements	Acceleration: X, Y, Z, Θ RPM Temperature Diagnostics
B - Bit forces	WOB, TOB, BOB
C - Pressures	Annulus pressure Tool bore pressure

DRILLVIEW® MODEL	MEASUREMENT SUITE INCLUDED
DrillView® DX (Dynamics)	A
DrillView® BX (Bit forces)	A + B
DrillView® EX (Expert)	A + B + C

DrillView® Tool Functional Specifications – All Models

MEASUREMENT	PARAMETER	SPECIFICATION
Acceleration (Dual Range)	Sampling rate	Programmable 60 Hz - 20kHz Initial field trials fixed at 1Khz, 5kHz
	Low pass filter	Programmable based on sampling frequency
RPM	Range	0 - 1,500
	Accuracy	+/- 1
Temperature	Range	-40 - 175°C (full measurement range)
	Accuracy	±1.5°C within -30 - 150°C range
	PARAMETER	**SPECIFICATION**
Operational and Environmental	Bit-Sub Collar OD	6 ¾ in. (6 ½ in. for prototypes)
	Bit-Sub Collar Length	12 ¾ in. (shoulder-shoulder)
	Bit-Sub Uphole Connection	PIN 4-1/2 REG
	Bit-Sub Downhole Connection	BOX 4-1/2 REG
	Field-replaceable Battery Life	>200 hrs. logging depending on acquisition mode
	Stored Data Memory Capacity	32 GB, provides >200 hrs. logging depending on acquisition mode
	Time synchronization	All data time-stamped using internal real-time clock
	Max. Operating Temperature	302°F (150 °C)
	Max. Operating Pressure	20,000 psi