

Scientific Drilling's BitSub is a short integrated sensor which provides at-bit real-time continuous inclination, azimuthal gamma ray, and drilling dynamics measurements.

At-bit azimuthal gamma ray provides real-time correlation and geosteering information, while the at-bit continuous inclination gives immediate feedback on wellbore directional trends. Together, these measurements give drilling engineers the earliest indication of when the well is in or out of the pay zone and the directional information they need to keep the well in the target formation. Additionally, lateral & axial vibration measurements and bit RPM enhance drilling performance and warn of inefficient or potentially damaging drilling conditions.

For more information on LWD solutions, contact your Scientific Drilling sales representative or visit:

<http://scientificdrilling.com/LWD>

### GENERAL SPECIFICATIONS

NOMINAL OD	5.25 in. - 5.40 in. Max (13.34 cm - 13.72 cm Max)
HOLE SIZE RANGE	5 <sup>7</sup> / <sub>8</sub> in. to 6 <sup>3</sup> / <sub>4</sub> in. (14.92 cm - 17.15 cm)
SUB MAKEUP LENGTH	29.00 in (73.66 cm)
BIT TO SENSOR DISTANCE	16.00 in (40.64 cm)
CONNECTION	3 <sup>1</sup> / <sub>2</sub> " Regular (Box*Pin)
MAX OPERATING PRESSURE	15,000 psi (103,421 kpa)
MAX OPERATING TEMPERATURE	302°F (150°C)
MAX OPERATING TORQUE	13,500 ft-lbf (18,116 Nm)
MAKEUP TORQUE PIN TO MOTOR	9,500 ft-lbf (12,880 Nm)
MAKEUP TORQUE BOX TO BIT	9,500 ft-lbf (12,880 Nm)
WEIGHT	125 lbs (57.6 kg)
MAX WOB	* Dependent on bottom hole assembly, motor configuration, and well plan
MAX RPM	500 RPM
MAX DOG LEG SEVERITY (DLS)	* Dependent on bottom hole assembly, motor configuration, and well plan
MAX MOTOR BEND	* Dependent on bottom hole assembly, motor configuration, and well plan
EXPECTED BATTERY LIFE	300 hours

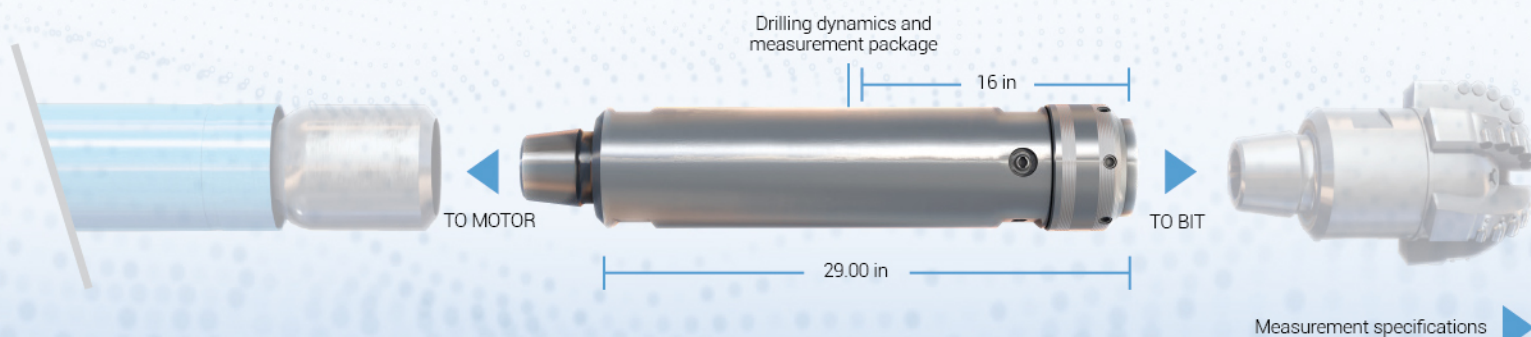
\*Specifications are subject to change without notice

### APPLICATIONS

- + Performance drilling
- + Geosteering

### BENEFITS

- + Drilling dynamics and measurement package is just 16 inches behind the bit makeup point, providing the ability for improved wellbore placement
  - Immediate indication of motor yield during slides
  - Immediate indication of unwanted build or drop on rotation
- + Faster response to trajectory changes prevents unintended bed boundary exit and creates a less tortuous borehole
- + BitSub works with a wide variety of mud motors and leads to an overall shorter and less expensive BHA, compared with conventional LWD tools.
- + Dynamics package directly measures and sends warning flags for the shocks and vibrations occurring right at the bit



# BitSub 4.75"

## MEASUREMENT SPECIFICATIONS

Scientific Drilling's BitSub provides a cost-effective geosteering solution. Placed between the motor and the bit, the always rotating sub utilizes Scientific Drilling's proprietary WiSci™ technology to communicate with the MWD tool and provide at-bit measurements back to the surface.

Whether sliding or rotating while drilling, the battery operated tool collects azimuthal gamma ray, continuous inclination, bit RPM, and vibration data just 16 inches from behind the bit.

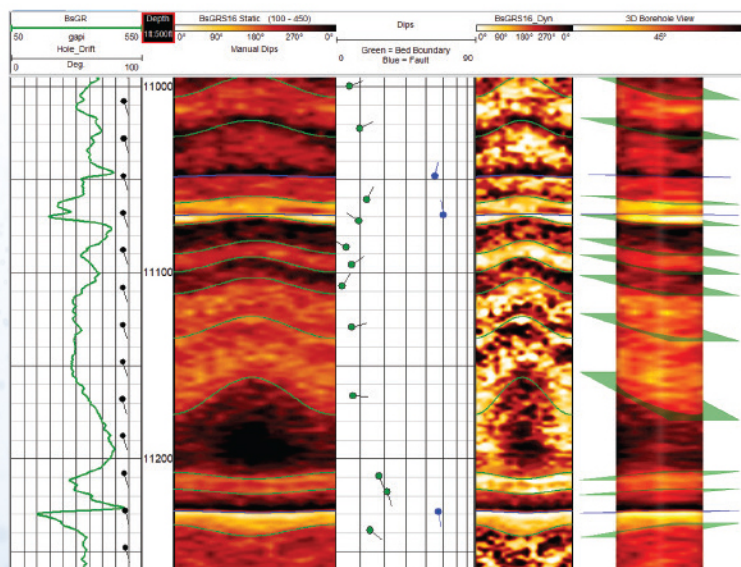
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### MEASUREMENT SPECIFICATIONS

DETECTOR	Focused, Eccentered, Scintillation NaI
RANGE	0 - 1000 API
AZIMUTHAL GAMMA BINS	Total, 2, 4, 8* Real-time, 16 Memory
STATISTICAL REPEATABILITY	+/- 2.1% at 60 ft/hr at 100 API
INCLINATION ACCURACY	Static +/- 0.15° Drilling +/- 0.3° Sliding, +/- 0.5° Rotating
STICK/SPIP RPM	500 - 1000 RPM, +/- 5
VIBRATION & SHOCK	0-50g, +/- 5%
MEMORY SIZE	300 Hours, all sensors captured @ 5 sec sample rate

\*when used with EM-telemetry

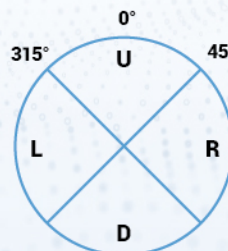


## APPLICATIONS

- + Geosteering / Stopping
- + Structural Dip information from images
- + Improve in-zone 'net-to-gross' wellbore position
- + Shale / Non shale identification

## BENEFITS

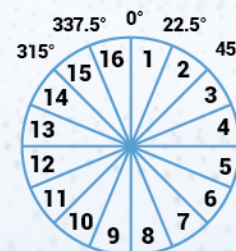
- + Azimuthal data obtained regardless of rotating or sliding from 16 inches behind the bit.
- + Several levels of Natural Gamma Ray available in real-time and memory mode
  - Total Gamma Ray for wellbore correlation and lithology identification
  - Simple Up / Down curves to indicate bed boundary entry/exit
  - Full Azimuthal 4 or 8\* sector Gamma Ray image real-time and 16 sector memory image for geosteering and wellbore structural dip calculations



Quadrant



8 bins



16 bins

General specifications