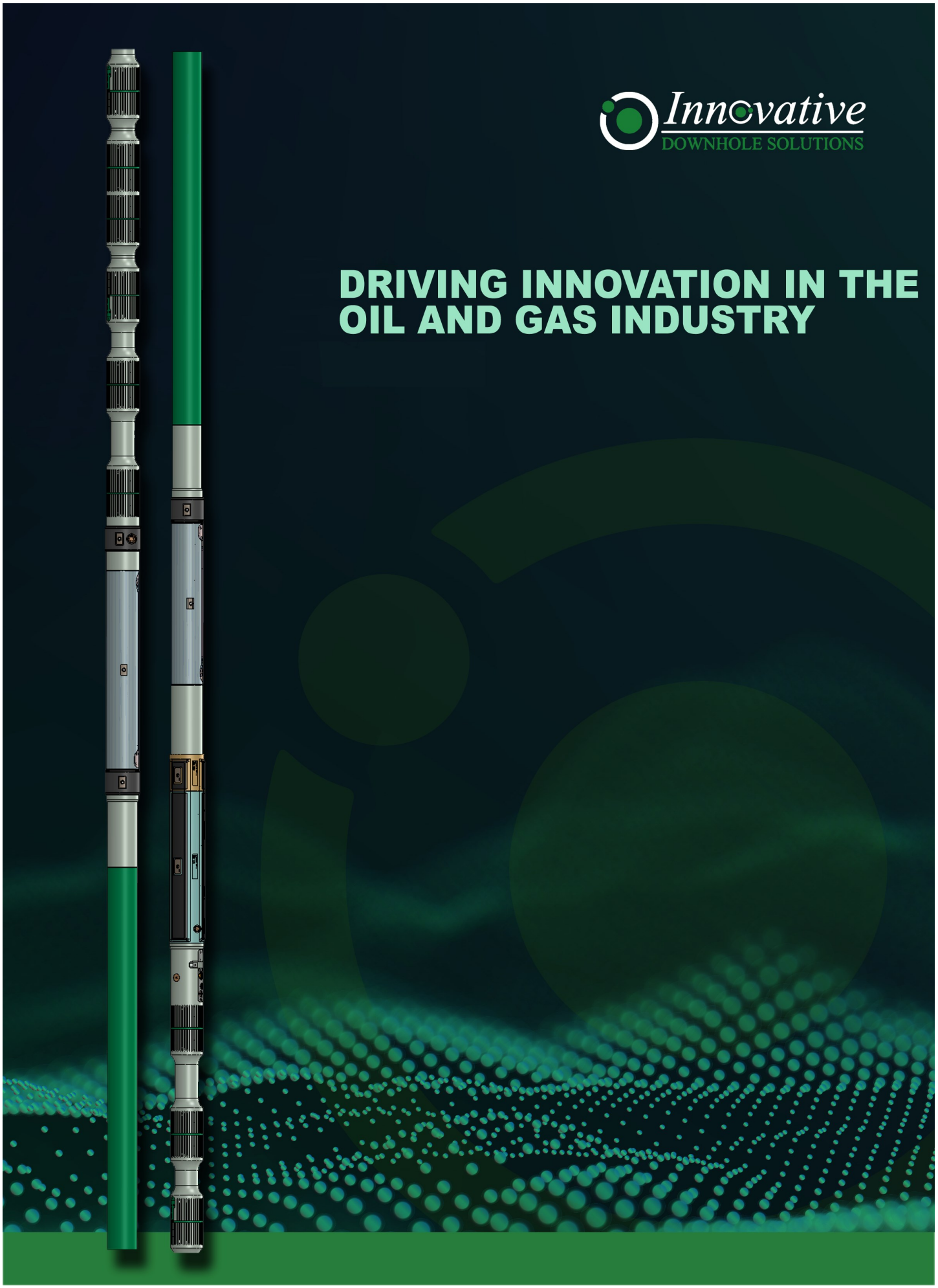
Innovative
DOWNHOLE SOLUTIONS
DRIVING INNOVATION IN THE
OIL AND GAS INDUSTRY

GEOEDGE COMPACT INTEGRATED LWD TRIPLE COMBO TOOL

GeoEdge is a new generation Logging While Drilling (LWD) tool from Innovative Downhole Solutions. This fully integrated triple combo tool combines an industry leading spectral/azimuthal gamma-ray, propagation resistivity, ultrasonic imager/caliper, neutron porosity, and caliper-corrected azimuthal density design in a single, compact collar.

- Resistivity/Spectral Azimuthal Gamma Ray/Neutron Porosity Density/Ultrasonic Imager/ Caliper in one 28 ft (8.5m) collar.
- 4 ¾" and 6 ¾" tool sizes.
- Equal or superior measurement accuracy and statistical precision versus the current market.
- Superior image quality from azimuthal density, azimuthal gamma, and azimuthal caliper and ultrasonic imager.
- Logging memory capacity +7 days (168 h) at the maximum data storage rate.
- Seven days operating time using (3) standard 26 amp.hr batteries.
- Compact high-capacity battery section can be provided in a 15 ft (4.5m) collar.
- Batteries can be disabled for shipping and long-term storage.

FEATURES & BENEFITS

All-in-one Multi-Function Tool

- Heli-portable: the whole BHA can be transported in a single lift.
- Reduces variable deck load and deck space offshore.
- Reduces footprint for smaller drill sites onshore.
- Minimizes BHA handling—time savings and HSE considerations.

Easy Access for Tool Maintenance

- Designed for efficient and cost-effective maintainability.
- Electronics and sensors are easily replaceable.

Recorded and Real-Time Data

- Large centralized memory, 14 day capacity, ultra fast ethernet download speed.
- Adaptable to any telemetry system through special translators.

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CUSTOMER DELIVERABLES

Spectral Gamma	Resistivity	Neutron	Density	PEF	Ultrasonic Imager Caliper	Vibration and RPM
Apparent GR Corrected GR Azimuthal GR Spectral GR Borehole Corrections	2Mhz & 400KHz Deep Medium Shallow Spacings Phase and Attenuation Measure-ments Total of 12 Measure-ments Borehole Corrections Distance To	Corrected Neutron Porosity Apparent Neutron Porosity Near/Far Detector Count Rates Borehole & Formation Corrections	Corrected Density Density Correction Azimuthal Density Azimuthal Density Correction Near/Far Count Rates Density Caliper Azimuthal Density Caliper	Near Detector PEF Far Detector PEF Azimuthal Near Detec-tor PEF Azimuthal Far Detector PEF	Average Standoff and Borehole Diameter Azimuthal Standoff and Borehole Caliper Azimuthal Amplitude Formation Image Mud Slowness	Lateral/Axial RMS Vibration Lateral /Axial Shock Rate Lateral/Axial Peak Shock RPM High-Resolution Shock and RPM Data

GENERAL SPECIFICATIONS

Tool Size	4 3/4”	6 3/4”
Maximum OD	5 1/4” (133mm)	7 1/4” (184mm)
Hole Sizes	5 7/8 6 3/4” (152-171mm)	8 1/2 9 7/8” (216-251mm)
Maximum Flow Rate	400 gpm (1,514 lpm)	800 gpm (3,028 lpm)
Maximum Weight on Bit	35,000 lbf (155,687 N)	55,000 lbf (244,652 N)
Maximum Drilling Torque	8,500 lbg-ft (11,524 Nm)	25,000 lbf-ft (33,896 Nm)
Connections	NC38 Box-Box	NC50 Box-Box
Maximum DLS Sliding	30°/100 ft (30°/30 m)	16°/100 ft (16°/30 ft)
Maximum DLS Rotating	15°/100 ft (15°/30 ft)	8°/100 ft (8°/30 ft)
Maximum Temperature	-4 to 347°F (-20 to 175°C)	
Maximum Pressure	20,000 psi (137.9 MPa)	

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FORMATION EVALUATION

Measurement Point	12.9 ft (3.93 m)
Frequencies	2 MHz and 400 KHz
Measurements	Phase Shift and Attenuation
Spacings	±16” (0.4 m), ±30” (0.76 m), ±46” (1.17 m)
Range (Ohm.m)	0.1 to 4000 2 MHz Phase 0.1 to 4000 400 KHz Phase 0.1 to 200 2 MHz Attenuation 0.1 to 100 400 KHz Attenuation
Vertical Resolution	8 to 12 in (203 to 305 mm)

Resistivity: Fully compensated resistivity section with two receivers and three transmitters on both sides of the receivers spaced at 16”, 30”, and 46” from the center of the receivers.

All transmitters operate at 400KHz and 2MHz.

The phase and amplitude of the receiver signals are processed to produce phase difference and relative attenuation to produce a total of 12 resistivity measurements.

All measurements are recorded to memory and are available in real time.

Borehole corrections can be applied to recorded and real-time data.

Inversion processing can be used to calculate distance to bed, true resistivity of current and nearest bed, and anisotropy ratios of both beds.

Imager: Modular ultrasonic imaging module consisting of two transducers, one facing the formation to measure travel time and amplitude of the formation reflection, and the second facing a metal surface inside the module at a fixed distance to determine mud slowness.

Mud slowness is used in the downhole firmware to calculate standoff in real time.

Data from the formation transducer is recorded in 128 azimuthal sectors to produce high-resolution images of travel time and formation acoustic impedance.

The travel time image is converted to a caliper azimuthal image using the measured mud slowness.

The formation acoustic impedance image is used to detect bed boundaries and fractures. A 16-bin compressed caliper and amplitude images can be

Measurement Point	8.8 ft (2.68 m)
Standoff Range	0 .5 to 3” (127 to 762 mm)
Mud Weight	Up to 14 ppg WBM/OBM
Caliper Accuracy	±0.075”
Vertical Resolution	0.5 in (127 mm)
Caliper/Formation Image Sectors	128 Recorded

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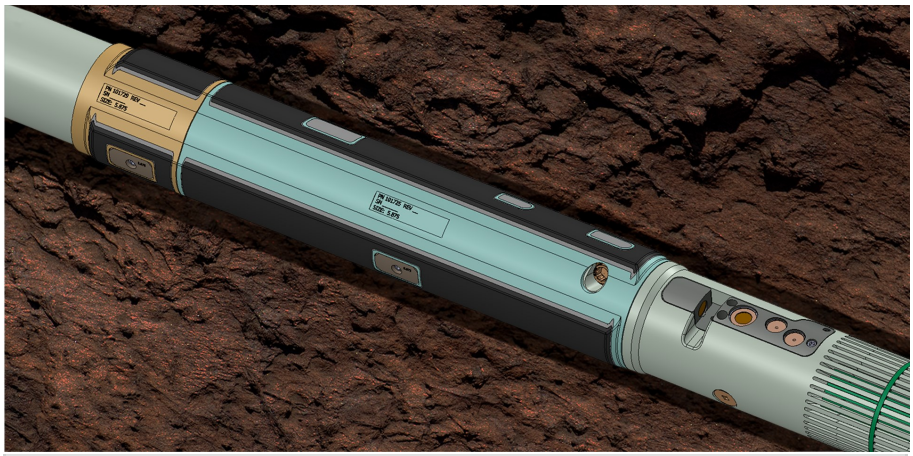
FORMATION EVALUATION



Measurement Point	6.1 ft (1.9 m)
Density Range	1.5 to 3.1 g/cc
PEF Range	1 to 10 B/e
Density Accuracy	±0.075 g/cc
PEF Accuracy	±0.15 B/e
Vertical Resolution	6–16 in (152.4–406.4 mm)
Density and PEF Images	32 sectors Recorded

Density: Azimuthal density section with two detectors. Detector sizes, spacings, and shielding are optimized to produce a measurement with minimum borehole effects and proper standoff compensation.

The stabilizer is easily removal to accommodate different borehole diameters ranging from 5 7/8” to 6 3/4” for the 4 3/4” tool and 8 1/2” to 9 5/8” for the 6 3/4” tool.

Data is sampled at a fast rate and corrected in real time in downhole firmware for toolface obtained from a directional sensor and/or standoff obtained from the ultrasonic caliper.

Azimuthally- and caliper-corrected density and photoelectric measurements are recorded in the downhole memory and are available for real time transmission.

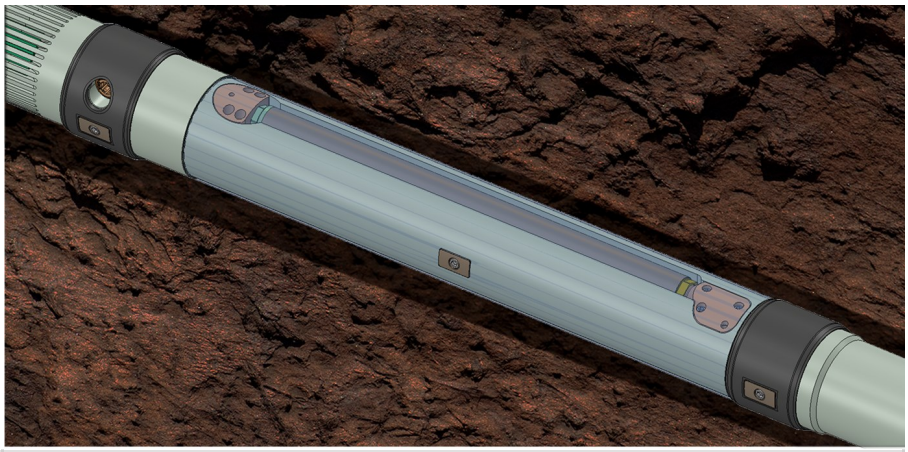
Density and photelectric images are recorded in 32 sectors and can be sent in real time in 16 compressed sectors.

Neutron: A traditional neutron porosity measurement using an Am -Be source and two large He-3 detectors.

The measurement is optimized for superior statistical precision and minimum environmental effects.

Corrections for borehole diameter, borehole water salinity, formation water salinity, standoff, borehole temperature and pressure, and formation capture cross section can be applied in surface software.

Corrections for light hydrocarbon effects are also available.



Measurement Point	17.7 ft (5.39 m)
Range	-4 to 100 PU
Accuracy	±0.5 PU
Vertical Resolution	16 in (406.4 mm)

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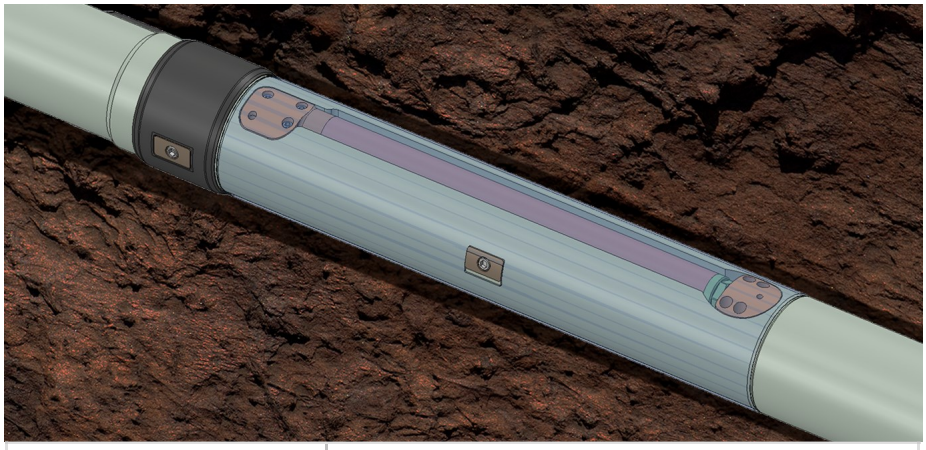

Measurement Point	1.7 ft (0.53 m)
Range	0 to 1200 API
Accuracy	±2 API
Vertical Resolution	8 in (203.3 mm)

Gamma Ray: Azimuthal gamma ray section placed near the bottom of the tool has a large gamma ray detector for enhanced azimuthal measurement.

Data is recorded in 32 azimuthal sectors and can be sent in real time in 16 sectors compressed.

The measurement is corrected for borehole diameter, mud weight, and potassium content in real time.

Uphole **Downhole**

- State-of-the-art electronics with fast digital processing of all measurements.
- Real-time communication can be adapted to any MWD system.
- Initialization of the entire tool is done through a single connection to a sidewall readout port.
- High-speed memory download using fast Ethernet communications to save rig time.
- The tool has self-diagnostic features to prevent unforeseen issues and automated data QC to guarantee that data provided to the customer is always of the highest quality.
- Component-level reliability monitoring using recorded shock, vibration, and temperature data.

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