

ThruBit FMI

Through-the-bit formation microimager

APPLICATIONS

- Reservoir characterization workflow in unconventional plays
- Evaluation of slim highly deviated and horizontal wells
- Fractured reservoir characterization and modeling
- Evaluation of structural geology and sedimentary features, rock texture analysis, and geomechanics answers
- Well placement, completion, and hydraulic fracturing optimization
- Secondary porosity evaluation
- Thin-bed detection and evaluation

The new ThruBit FMI* through-the-bit formation microimager is a slim formation-imaging tool for conductive mud environments. The tool's 2½-in diameter makes the ThruBit FMI microimager the slimmest geological imaging tool in the industry.

As the latest addition to ThruBit* through-the-bit logging services, the ThruBit FMI microimager is deployed using the unique ThruBit services conveyance platform to acquire high-resolution image data in memory mode. This combination of operational flexibility and image data comparable with the industry-standard FMI* fullbore formation microimager efficiently delivers critical structural, stratigraphic, and geomechanical answers.

Although the physics of the measurement and electrical range of the ThruBit FMI microimager are similar to those of the FMI microimager, the design—especially for the pads—is completely new. The innovative pad configuration, in the shape of a bow spring, makes it possible to package the state-of-the-art electrical and mechanical components in the 2½-in-diameter body. Each pad section comprises four arms arranged perpendicular to each other. Each arm has two rows of 6 electrical buttons, totaling 12 buttons per arm and 48 buttons for each pad section. The pads are applied against the formation face by extending the spring-mounted arms in open hole.

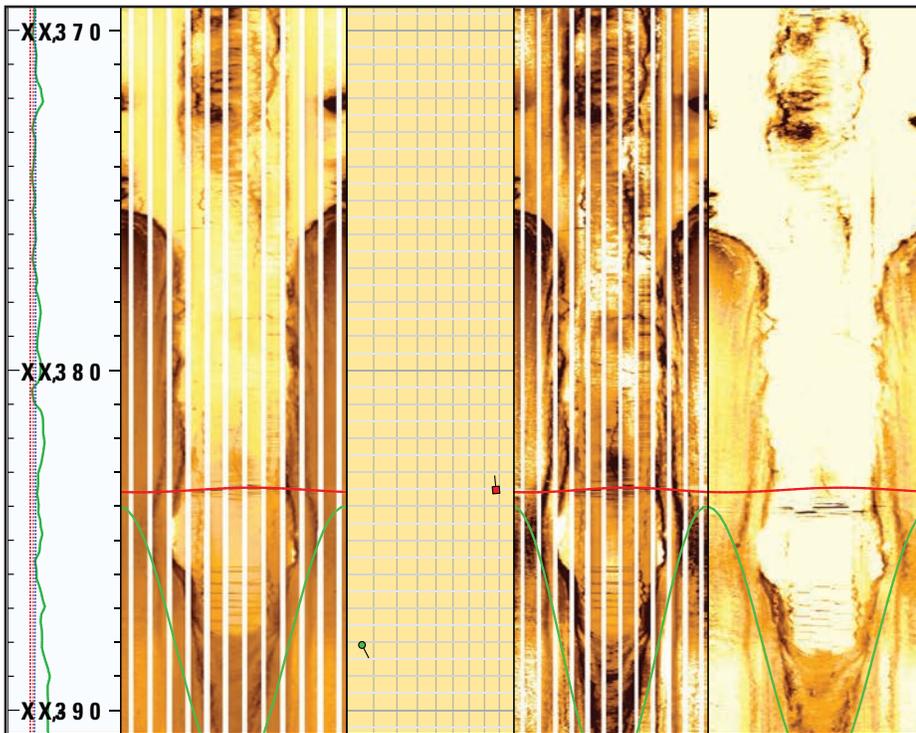
The ThruBit FMI microimager can be configured with up to 3 pad sections for a total of 144 buttons, providing nearly 80% borehole coverage in a 6-in borehole. In addition to the continuous electrical image, the ThruBit FMI microimager acquires two diameters from each pad section. Hole deviation and relative bearing are also measured. Merging these data with the well survey information obtains the hole azimuth.

Run centralized as positioned by its pad sections and additional centralizers in the toolstring, the ThruBit FMI microimager is placed below the density tool and above ThruBit services' sonic and induction tools to provide a complete advanced formation evaluation dataset from a single trip in the hole.

The ThruBit FMI microimager is fully compatible with the Techlog* wellbore software platform for interpretation products and answers.



ThruBit FMI through-the-bit formation microimager made up with three pad sections.



In addition to accurate dip measurement, the ThruBit FMI microimager captures features with extreme clarity at 0.2-in nominal resolution to support formation evaluation.

Measurement Specifications

	ThruBit FMI Formation Microimager
Output	Formation images and dips, two axial diameters
Logging speed	1,800 ft/h [549 m/h]
Range of measurement	Sampling rate: 0.05 in [0.13 cm] Borehole coverage: 80% in 6-in [15.24-cm] hole
Vertical resolution	0.2 in [0.51 cm]
Accuracy	Diameter: ± 0.2 in [± 0.51 cm] Deviation: $\pm 0.2^\circ$ for $5^\circ < \text{deviation} < 85^\circ$
Depth of investigation	1 in [2.54 cm]
Mud type or weight limitations	Water-base mud (maximum mud resistivity [R_m] = 50 ohm.m)
Logging environment	Open hole
Combinability	Fully combinable with ThruBit services tools
Special applications	Slim highly deviated and horizontal wells Memory mode Memory pumpdown mode

Mechanical Specifications

	ThruBit FMI Formation Microimager
Temperature rating	350 degF [176 degC]
Pressure rating	17,500 psi [121 MPa]
Borehole size—min.	5.5 in [13.97 cm] Through-pipe conveyance: 2.375-in [6.03-cm] min. drift ID
Borehole size—max.	9.75 in [24.77 cm]
Outside diameter	2.125 in [5.4 cm]
Length	31.13 ft [9.49 m]
Weight	138 lbm [62.6 kg]
Tension	30,000 lbf [133,450]