

4D Caliper™

EM Borehole Imager



Description

High accuracy electro-magnetic borehole imaging tool which acquires pulse-echo measurements while rotating in oil based mud systems.

The measurement principle is electro-magnetic pulse-echo, where borehole size and shape is derived from time-of-flight, and amplitude is derived from the echo/reflection

The 4D Caliper has up to 4 pairs of transducers and receivers, which are spaced 90° apart in the same plane, allowing to obtain high-resolution 2 axis measurements for all samples.

In addition to its imaging capabilities, it captures wide-band vibration, shocks, instantaneous tool face and RPM.

The 4D Caliper has its own internal batteries, memory and sensors to determine azimuthal orientation.

The Tool Collar I.D is a straight and through bore I.D allowing it to be included in any Bottom-Hole-Assembly.

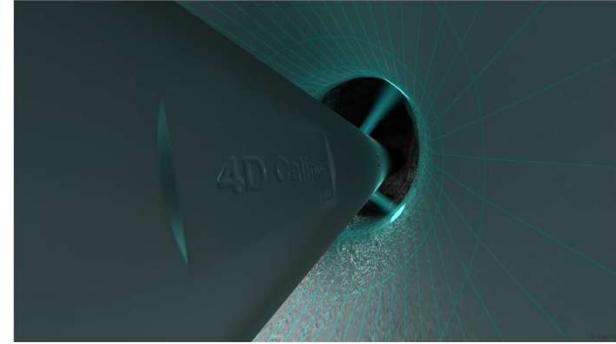
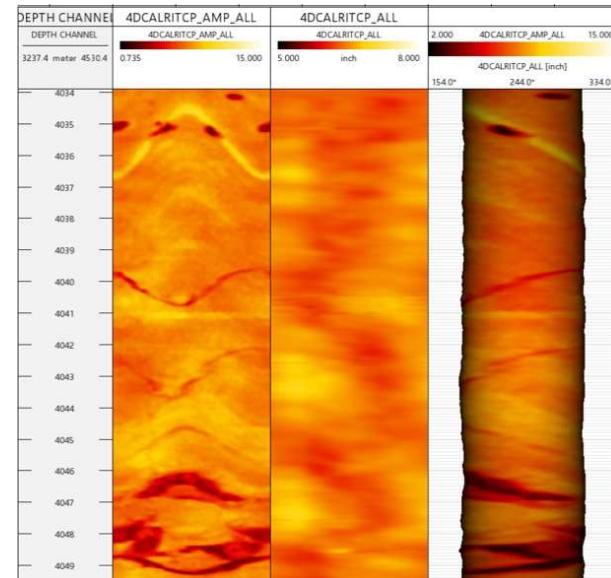
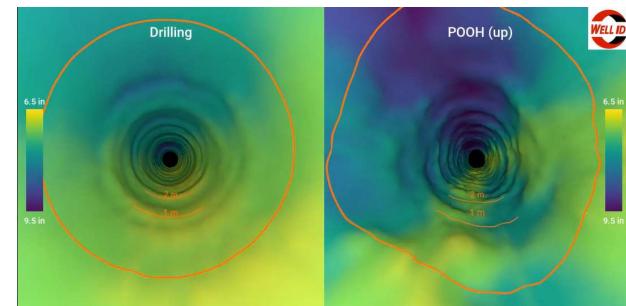


Illustration of how the 4D Caliper scans the borehole while drilling.



Log showing amplitude and radius where formation layers can be observed



Visualization of borehole shape and size while drilling vs same when rotating out of hole. Significant development in shape can be observed from the example.

Deliverables

- High-resolution amplitude image
- High-resolution radius image
- Instantaneous RPM and tool face
- Tri-axial vibration, stick-slip and whirl
- Temperature
- 3D and 4D Visualization

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Measurement and Performance Specifications

| PARAMETER | SPECIFICATIONS | |
|--------------------------|--------------------------|--|
| Imaging | Caliper (time-of-flight) | Amplitude (unitless) |
| Imaging – Orientation | Gravity High-side | Magnetic |
| Binning Capability | 64 to 512 bins | |
| Caliper accuracy, in | ± 0.04 | |
| Mud system compatibility | Oil Based Mud | |
| Data Recording | Accelerations & RPM | 500 – 1,000 sps |
| | Caliper & Amplitude | 400 – 800 sps |
| Memory | Internal 128 GB | Configurable, Nom. 500 logging hours |
| Power Source | Internal Batteries | Configurable, Nom. 140 operational hours |

Mechanical and Environmental Specifications

| PARAMETER | 950 |
|--|-----------------------|
| Borehole Size Coverage, in | 12.25 - 26 |
| Nominal Collar O.D, in | 9.50 |
| Maximum Collar O.D, in | 9.50 |
| Nominal Collar ID, in | 3.00 |
| Collar Length, in | 65.5 |
| Connections | API REG 7-5/8 Box-Pin |
| Make-up Torque, ft-lb | 81,000 |
| Overpull non-rotating, Operational lbf | 2,100,000 |
| Max. RPM | 250 |
| Max. DLS rotating, deg / 100 ft | 6 |
| Max. DLS sliding, deg / 100 ft | 12 |
| Max. Temperature Operating, °F (°C)* | 257° F (125° C)* |
| Max. Operating Pressure, psi | 14,500 psi |
| Max. Mud Flow Rate, GPM | 1,200 |
| LCM limitations | No practical limit |

* Higher temp. available upon request