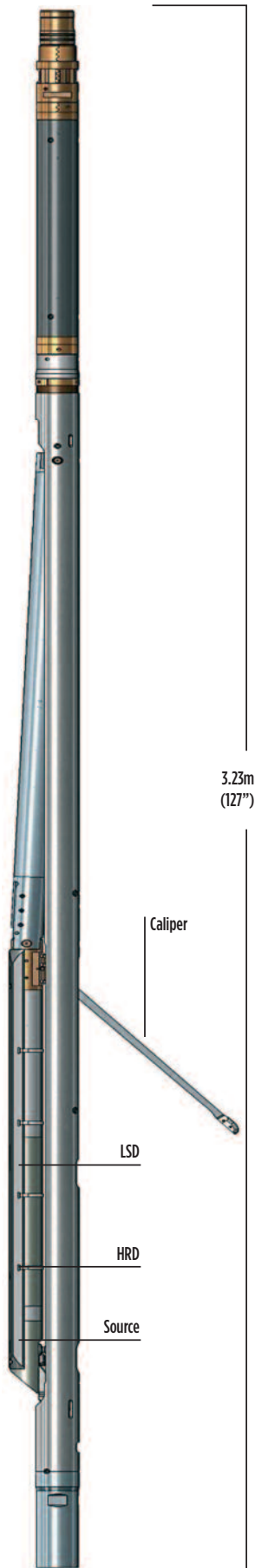


# Litho-Density (GLD)



Litho-Density Module

The Litho-Density module combines a borehole-corrected bulk density measurement with a photoelectric lithology log (Pe).

The radioactive source and detectors are mounted in an articulated skid that is maintained in contact with the borehole wall by a powered backup arm to minimise borehole rugosity effects. The arm also doubles as a caliper measurement. The tool may be combined with compensated neutron and focused induction measurements in the classic 'triple-combo' configuration.

## Principle of Measurement:

Gamma radiation from a  $^{137}\text{Cs}$  source in the tool is Compton scattered by the formation and detected by two scintillation detectors. The relative intensities of the radiation at each detector give a measurement of formation bulk density. The photoelectric measurement is derived from the ratio of the gamma intensities in high and low energy windows at a detector. It depends of the formation atomic number and is a good lithology indicator. The measurements are influenced by the borehole environment. These effects are minimised by corrections calculated by extensive Monte Carlo modelling and benchmarked to standards at the Callisto facility in Leicestershire, UK.

## SPECIFICATION:

### Features

- Drift eliminated by digital circuitry and active calibration loops based on internal reference sources
- Well characterised tool response based on computer calculations
- Tungsten carbide coated wear plate on skid can be replaced in the field
- High-resolution measurement
- Maximum data sampling rate is 1cm (0.4")

### Measurements

- Bulk density ( $\rho_B$ )
- Correction indicator ( $\Delta\rho$ )
- Photoelectric effect (pef)
- Borehole Diameter

### Applications

- Matrix Identification
- Formation fluid analysis
- Porosity from density

### Operating Conditions

- Borehole type: open hole 4" to 12"

### Specifications

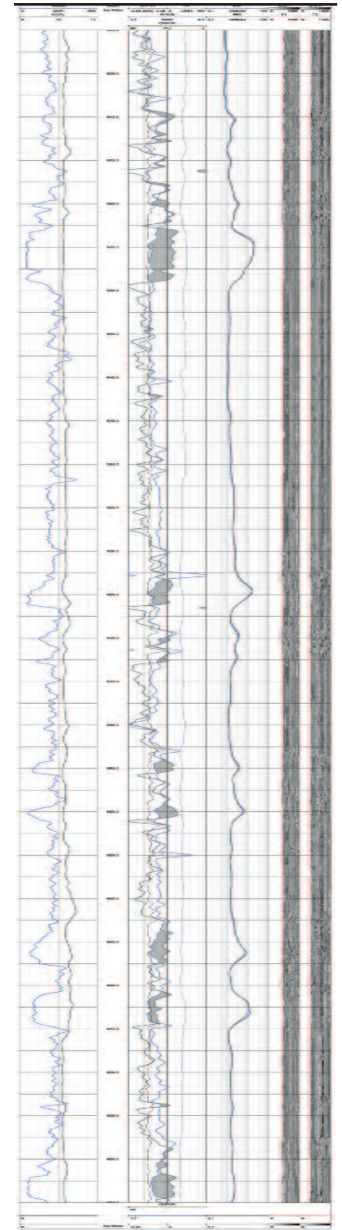
- (HRD; LSD) density sensors offsets 160 mm (6.3") , 399 mm (15.7")
- Diameter: 84mm (with stand-off), 74mm (without stand-off)
- Length: 3.23m (127")
- Weight: 57kg (125.6lb)
- Max. temperature: 125°C
- Max. pressure: 86MPa (12,500psi)
- Density range: 1.1 -2.95 g/cc +/- 0.005 g/cc (1 std deviation)
- Density radius of investigation: 102 mm (4") to 152 mm (6")
- Photoelectric range: 1-10 Barns
- Caliper range: 90mm (3.54") - 300mm (12")
- Caliper resolution: 1 mm (0.04")

### Part Numbers

- 1003937 Litho-Density module

### Accessories:

- 1013961 18.5GBq  $^{137}\text{Cs}$  source
- 1004126 Source holder
- 1004125 Source transport pig
- 1004123 Source handling tool set
- 1004129 Density/ Pe calibrator
- 1004131 Caliper calibrator



Example of logging data