

## SMALL-SOURCE DENSITY PROBE

Stringent legislation on the transport and handling of radioactive materials increasingly prevents use of conventional density logging probes. The small-source density probe provides high-quality calibrated and borehole-compensated density logs at sensible logging speeds using a very low strength nuclear source that does not require a radiation licence in many territories.

### PRINCIPLE OF MEASUREMENT:

The probe contains a small collimated gamma source and two high-sensitivity scintillation gamma detectors. The detectors are protected against direct radiation from the source or via the borehole by extensive heavy-metal shielding. The active windows of source and detector are maintained firmly in contact with the borehole walls by a motorised back-up arm that also provides a borehole caliper measurement. Gamma radiation from the source is backscattered by the formation (Compton effect) and reaches the two detectors where the relative count-rates provide a measure of formation bulk density. The probe includes a third gamma detector mounted remotely from the source to allow 'stripping' of natural background radiation.

### FEATURES

- Compensated density output directly in engineering units (g/cc)
- Tungsten shielding reduces borehole influence on measurement
- Automatic stripping of background radiation
- Powerful motorised caliper arm maintains good sidewall contact
- Separate short-spacing detector for accurate bed-boundary location

### MEASUREMENTS

- Borehole-compensated formation density
- High-resolution density
- Caliper
- Natural gamma
- Borehole inclination

### APPLICATIONS

#### Minerals

- Lithology
- Density and porosity
- Correlation with other logs
- Bed thickness and boundary location
- Ash content in coal

#### Engineering

- Rock strength and elasticity parameters (with sonic log)
- Detection of weathered or fractured zones
- Ground compaction studies

#### Water

- Location of aquifer and aquitard
- Porosity measurement
- Location of cement cavities behind casing

### OPERATING CONDITIONS

- Borehole type:** open-hole, water-filled  
Qualitative measurements are possible in air-filled boreholes

### SPECIFICATIONS

- Diameter:** 51mm  
**Length of sonde:** 2.75m  
**Weight:** 19kg  
**Max. temperature:** 70°C  
(extended range available)  
**Max. pressure:** 20MPa  
(extended range available)  
**Density detectors:** NaI(Tl) scintillation crystal  
**Density range:** 1-3g /cc  
**Caliper range:** 50 - 250mm

### SALES INFORMATION

- Probe:**  
25 010 000 Small-source density probe with source holder, source transport pot, caliper calibrator
- Accessories:**  
31 004 000 3.7MBq <sup>60</sup>Co source  
20 081 000 Aluminium calibration block  
20 070 000 Natural-gamma API calibrator without source  
30 010 000 3.7MBq <sup>137</sup>Cs source for natural-gamma calibrator

