

Nuclear Probes

Compensated Neutron & neutron-neutron Probes

APPLICATIONS

Compensated Neutron

- Quantitative Porosity
- Lithology Identification
- Petrophysical properties
- Correlation
- Aquifer analysis

Neutron-Neutron

- Qualitative Porosity
- Lithology Identification
- Petrophysical properties
- Correlation
- Aquifer analysis

The compensated Dual Neutron Sonde provides quantitative formation porosity measurements in uncased holes, based on Hydrogen Index. The Neutron-Neutron probe is a single detector slim probe for qualitative porosity measurements in most borehole conditions.

OVERVIEW

Dual Neutron Compensated Neutron: The sonde uses a bottom loading neutron source and a set of two detectors at different spacing to detect the neutrons that are slowed down by hydrogen in the formation. As the sonde is sensitive to hydrogen, it is used to distinguish between fluid bearing formations and solid matrix rock. In order to optimise performance, the sonde is designed with three main features:

1. A side-walling bow spring to ensure that the detector measures only the neutrons slowed by the formation.
2. A detector mandrel diameter that is large enough to minimise the sonde and borehole curvature mismatch and improve sonde to formation contact to minimise the effect of the borehole fluid.
3. An efficient detector shield to prevent neutrons from travelling up, inside the sonde body.

Neutron-Neutron: A reduced diameter version with only one detector is available for qualitative porosity measurements and can be run in any environment.



SPECIFICATION

	Dual Neutron	Neutron-Neutron
Weight	23 kg	5 Kg
Length	1.67 m	1.44 m
Diameter	60 mm	38 mm
Detector	x2 ^3He	x1 ^3He
Source	Proportional counters $^{241}\text{Am-Be}$	Proportional Counter $^{241}\text{Am-Be}$
Max. Pressure	Typically 2.5 Ci 20 MPa	1Ci 20 MPa
Max. Temperature	80°C	80°C
Combinability	Modular (Can connect probes above only)	Modular (Can connect probes above only)
Borehole	Water, Mud Open/Cased Hole	Water, Mud Open/Cased Hole
Centralisation	Ex-centralised	Not Required
Accessories	Bow Spring Verification jig Source holder Source handling tool	Source holder

Density Probes

Formation Sidewall & Slim Trisonde Probes

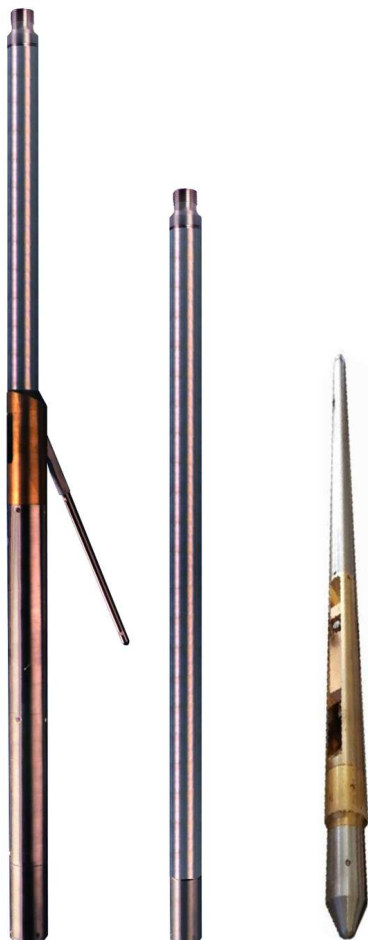
APPLICATIONS

FDSB

- Calculated Density Porosity
- Lithology and Ore-body identification
- Quantitative Density
- Borehole Diameter
- Bed Boundaries
- Coal ash & moisture content
- Petrophysical properties

Trisonde

- Mineral quality
- Lithology determination
- Coal bed identification
- Cement pile testing
- Petrophysical properties



The Geovista range of density probes are designed to measure high quality density measurements

OVERVIEW

Formation Density Probe (FDSB): This combinable sonde is suitable for quantitative formation density measurements in uncased holes. It uses a bottom loading gamma ray source (Typically 100 mCi activity) and a set of two or optionally three detectors at different spacing to detect the gamma rays scattered by the formation. The amount of scattered gamma rays is a function of the electron density of the formation material and hence, a function of its bulk density. This relationship is used to calibrate the density sonde and then use it to log the bulk density of the formations crossed by the borehole. In order to optimise performance, the sonde is designed with three main features:

1. A side-walling caliper to ensure that the detector measures only the radiation scattered by the formation.
2. A detector mandrel diameter that is large enough to minimise the sonde and borehole curvature mismatch and improve sonde to formation contact to minimise the effect of the borehole fluid.
3. An efficient detector shield to prevent gamma rays from travelling up, inside the sonde body.

Trisonde: Provides qualitative density measurements and a natural gamma ray with three detectors (radioactive source is bottom loading).

Slim Side Loading Density: Provides qualitative density measurements with two detectors and is a fully combinable probe (radioactive source is side loading)

SPECIFICATION

	FDSB	Trisonde 2-Pi Gamma-Gamma	Slim Side Loading
Weight	26 kg	5 Kg	5.0 kg
Length	2.06 m	1.65 m	1.44 m
Diameter	54 mm	38 mm	46 mm
Detector	x2, NaI crystals Spaced at 47 and 25 cm (Optional addition of a detector at 14 cm)	x3 NaI crystals (Gamma Ray, LS & SS density)	x2 NaI crystals (LS & SS density)
Source	¹³⁷ Cs or ⁶⁰ Co	¹³⁷ Cs (10mCi)	¹³⁷ Cs (10mCi)
Density Range	1-3 or 1- 4.5 g/cc	qualitative	qualitative
Caliper Range	60 to 350 mm	No caliper	No caliper
Max. Pressure	20 MPa	20 MPa	20 MPa
HP version	35 MPa	35 MPa	35 MPa
Max. Temperature	80°C	80°C	80°C
HT version	HT 125°C	HT 125°C	HT 125°C
Combinability	Modular (Can connect probes above only)	Modular (Can connect probes above only)	Modular
Borehole	Any Open Hole	Any Hole	Any Hole
Accessories	Calibration blocks Verification jig Source holder Source handling tool		