

2021 GEOPHYSICAL LOGGING SERVICES

Safe, Reliable, Transparent, Flexible.



Borehole Wireline's logging service includes

- a truly, reliable, flexible, transparent and safe service.
- Our logging system is the only flexible "stackable" system available in today's mineral logging market. In general terms "stackability" means we can add a probe to an existing logging run in the borehole rather than having to perform an additional logging run in the borehole. **This saves you time and money!**
- ISO 9001, ISO4001 and AS/NZS 4801 certified.
- Vehicle based and portable unit configurations.
- Large probe inventory with ample redundancy.

Able to provide specialist logging services:

BMR (Magnetic Resonance)

P&S Seismic Suspension

- Experienced in the Iron Ore, Coal, Uranium, Groundwater and Geotechnical sectors
- Iron Ore logging experience totalling over 500,000 metres per year (with Iron Ore operations in WA, SA, NT).
Coal logging experience totalling over 300,000 metres per year in SA, WA, QLD.
Uranium logging experience totalling over 100,000 metres nationwide, per year.
Gyroscopic deviation logging experience totalling over 75,000 metres per year.
Acoustic and optical borehole imaging experience totalling over 90,000 metres, per year.
(The only logging contractor to offer experienced, 3rd party image processing)

2021 GEOPHYSICAL LOGGING SERVICES

Safe, Reliable, Transparent, Flexible.

SERVICE PLATFORMS

Logging Unit:	S3-1100 Troopcarrier	(Up to 1100m depth capacity)
Logging Unit:	S2-2000 Isuzu Medium Rigid	(Up to 1800m depth capacity)
Logging Unit:	P3-1100 Portable	(Up to 1100m depth capacity)

PROBES: FORMATION CHARACTERISATION—NUCLEAR

Gamma:	Total Gamma
Gamma:	Spectral Gamma (K, U, TH)
Formation Density:	Dual Spacing
Formation Density:	Triple Spacing with single focused resistivity
Formation Density:	Spectral Density with single focused resistivity
Formation Density:	Dual Density Trisonde (Side Loading)
Neutron Porosity:	Dual Spacing (Porosity)

PROBES: FORMATION CHARACTERISATION—ELECTRICAL, ELECTRO-MAGNETIC, MAGNETIC

Resistivity:	Dual Laterolog (Focussed Resistivity)
Conductivity:	Dual Induction (Conductivity)
Magnetic Resonance:	Borehole Magnetic Resonance (BMR)
Magnetic Susceptibility:	
Induced Polarisation:	IP
Spontaneous Potential	SP

PROBES: FORMATION CHARACTERISATION-VELOCITY

Fullwave Sonic:	1 transmitter & 4 receivers	(60cm, 80cm, 100cm, 120cm)
Suspension Seismic	P & S Wave Measurement	

PROBES: BOREHOLE IMAGING

Borehole Imaging:	Acoustic Scanner
Borehole Imaging:	Optical Scanner

PROBES: BOREHOLE DEVIATION

Borehole Deviation:	Magnetic Deviation (includes Magnetic Vectors)
Borehole Deviation:	Gyroscopic Deviation
Borehole Deviation:	North Seeking Gyroscopic Deviation (Fibre Optic)

PROBES: GROUNDWATER : WATER QUALITY, FLOW & SAMPLING

Water Quality:	Fluid Temperature or Fluid Temperature & Conductivity
Flowmeters:	Impeller & Heatpulse Flowmeters
Fluid Sampler:	
Water level:	

PROBES: URANIUM EXPLORATION & PRODUCTION

Gamma:	Total Gamma
Gamma:	Spectral Gamma (K, U, TH)
Gamma:	Filtered
Gamma:	Geiger Muller

PROBES: OTHER

Caliper:	2 Arm & 3 Arm
CCTV Camera:	Borehole Camera (downhole and Sideview)
Fishing	Fishing Operations

UNITS

Geophysical Logging Platforms.

- S3-1100 Troopcarrier (Up to 1100m depth capacity)
- S2-2000 Isuzu Medium Rigid (Up to 1800m depth capacity)
- P3-1100 Portable (Up to 1100m depth capacity)



GEOPHYSICAL LOGGING UNITS

Logging Unit Series 3-1100

3-1100



SPECIFICATIONS

TOYOTA 70 TROOPCARRIER

Weight	3700 kgs Max (weight upgraded)
Engine/Fuel	4.5L Turbo Diesel, Euro IV emissions 180L capacity
Probe storage	Internal padded drawer system
240VAC	4 kva inverter (full sine wave)
Tyres	6 x (2 spare), Cooper ST MAXX
Communications	UHF radio, Bluetooth 3 G car kit, sat phone
Winch	1100m, 3/16", 4 conductor wireline
Logging system	GV Logger, WellCAD, Windows 7
Recovery Equipment	Snatch strap, mounted recovery points, shovel
Navigation	Dash mounted GPS, reverse camera, GPS tracking
Safety	SRS airbag, ROPS, 1st aid kit, fire extinguishers, HID spot lights, emergency power isolation system, beacon, bull bar, large tool box

GEOPHYSICAL LOGGING UNITS

Logging Unit Series 3-1100

3-1100



Our units are designed to be truly standalone as the most part of our work is exploration and large distances from base or towns:

- Full mine site safe working compliance.
- All units have had a suspension and weight upgrades.
- Flexibility around the drill pad where our logging booms have a 360° working area arc.
- Logging boom can be raised to allow full use of the wireless winch control enabling safe handling of probes into and out of the borehole.
- Wireline washing system for contamination control.
- Work trestles for safe handling of logging probes from the transport drawers and return.
- Washing hose for probe cleaning and general house keeping.



GEOPHYSICAL LOGGING UNITS

Logging Unit Series 2-2000

2-2000



SPECIFICATIONS

ISUZU 300 4x4 SiTEC 155 Series 2

Weight	GVM 6000 kg
Engine/Fuel	5.1L Turbo Diesel, 240L Fuel Capacity
Probe storage	Internal padded racking system
240VAC	Separate Onan generator
Tyres	8 x (2 spare), HD Trade Tyres
Communications	Long range UHF radio, Bluetooth 3 G car kit, sat phone
Winch	2000m, 3/16", 4 conductor wireline
Logging system	GV Logger, WellCAD, Windows 7
Boom	Hi-Ab Crane
Drive	4 x 4 Capability
Navigation	Dash mounted GPS, reverse camera, vehicle tracking
Safety	SRS airbag, ROPS, 1st aid kit, fire extinguishers, HID spot lights, emergency power isolation system, beacon, bull bar, large tool box

GEOPHYSICAL LOGGING UNITS

Logging Unit Series 2-2000

2-2000



Our units are designed to be truly standalone as the most part of our work is exploration and large distances from base or towns:

- Full mine site safe working compliance.
- Deeper borehole logging capability.
- Hydraulic, extendable Hiab crane allows full use of the wireless winch control enabling safe handling of probes into and out of the borehole.
- Wireline washing system for contamination control.
- Work trestles for safe handling of logging probes from the transport drawers and return.
- Washing hose for probe cleaning and general house keeping.

GEOPHYSICAL LOGGING UNITS

Logging Unit

Series 3-1100 Portable

3-1100P



SPECIFICATIONS

PORTABLE LOGGING UNIT

Weight	200 kgs Max with additional accessories
Probe storage	Padded Transport Cases
240VAC	12V to 240VAC 4 kva inverter (full sine wave) Or 240VAC portable generator
Winch	1100m, 3/16", 4 conductor wireline
Logging system	GV Logger, WellCAD, Windows 7
Portability	Vehicle tray mounted Heli-lift capability Barge, offshore rig accessible.

GEOPHYSICAL LOGGING UNITS

Logging Unit Series 3-1100 Portable

3-1100P



Our portable units are designed to be truly standalone as the most part of our work is exploration and large distances from base or towns:

- Full mine site safe working compliance.
- All portable units have heli-lift design capabilities.
- Rugged design for surface control operations.
- Work trestles for safe handling of logging probes from the transport drawers and return.
- Probe transportation using padded transportation cases.
- Tripod access to borehole where drill rig not present. Sheave wheel access to borehole with drill rig.

PROBES

FORMATION CHARACTERISATION - NUCLEAR.

- Gamma: Total Gamma
- Gamma: Spectral Gamma (K, U, TH)
- Formation Density: Dual Spacing
- Formation Density: Triple Spacing with single focused resistivity
- Formation Density: Spectral Density with single focused resistivity
- Formation Density: Dual Density Trisonde (Side Loading)
- Neutron Porosity: Dual Spacing (Porosity)

GEOPHYSICAL LOGGING PROBES

Total Gamma

NGRS

MEASUREMENT PRINCIPLE

The total gamma probe measures naturally occurring radioactivity. The most common naturally occurring radioactivity is associated with K^{40} , Th^{232} and $U^{232-238}$ which are associated with certain rocks (eg clays/shales) making the gamma curves an excellent lithological identifier tool. A scintillation detector system consisting of a sodium iodide crystal and a photomultiplier tube to measure gamma radiation.

Ideally suited for:

- Uranium exploration and mining.
- Uranium grade determination.
- Coal and iron ore exploration
- Sedimentary studies.
- Logging run depth matching.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.

(Downhole logging can be recorded for QA purposes)

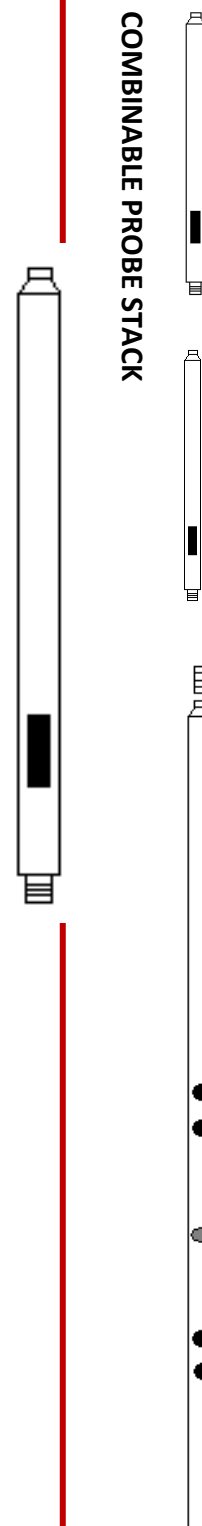
Calibration via Adelaide Models – AM1, AM2, AM3 for Uranium grade and AM6 for API calibration.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

Gamma, filtered gamma, magnetic deviation, caliper, fluid temperature/conductivity dual laterolog, dual induction, formation density, fullwave sonic, gyroscopic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

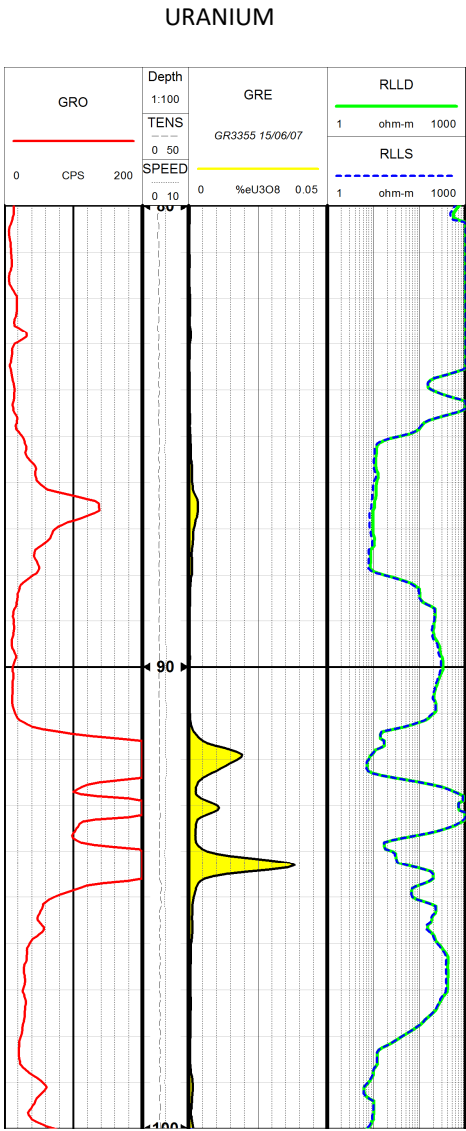
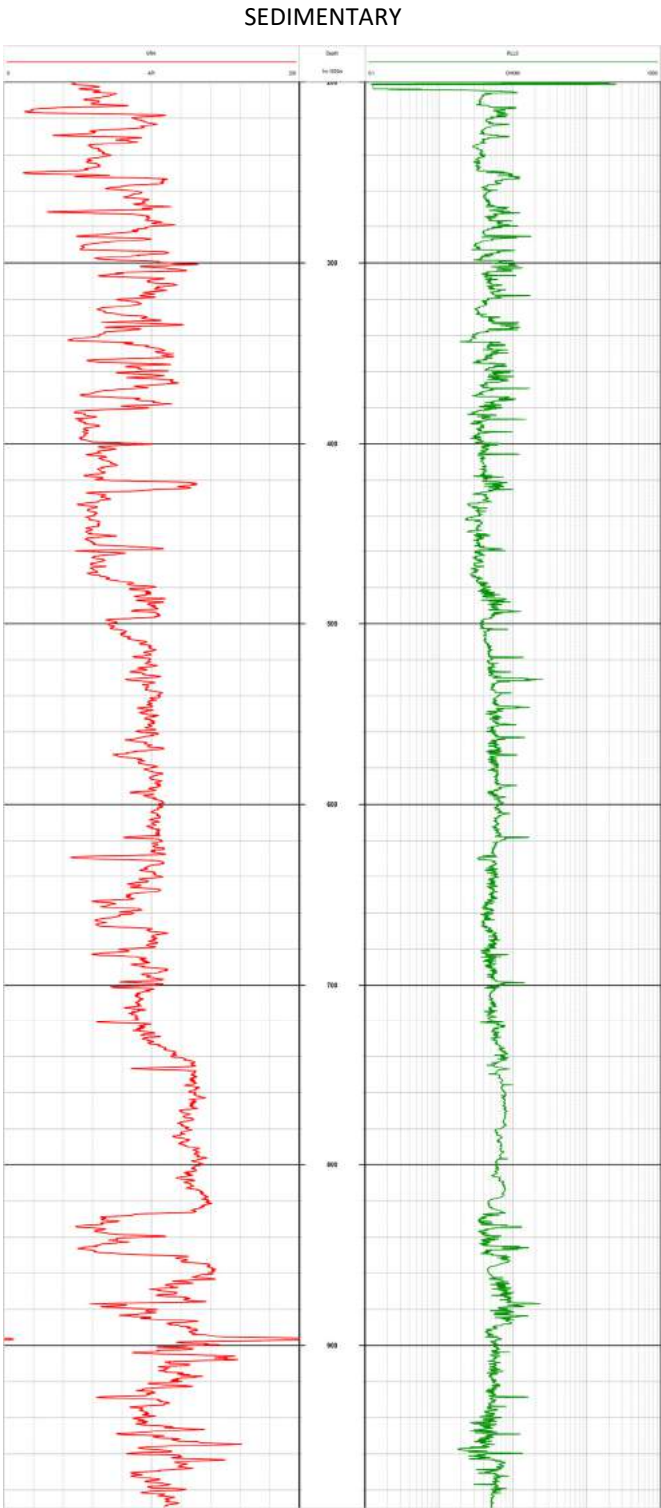
**PHYSICAL SPECIFICATIONS**

Weight	5.0kg
Length	0.63m
Diameter	38mm
Crystal size	25mm x 50mm
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

Total
Gamma

NGRS



SINGLE PROBE



COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Spectral Gamma

SGAM

MEASUREMENT PRINCIPLE

Spectral gamma probes measure naturally occurring radioactivity. The most common naturally occurring radioactivity is associated with K^{40} , TH^{232} and $U^{232-238}$ which are associated with certain rocks (eg clays/shales) making the gamma curves an excellent lithological identifier tool. The spectral gamma probes use a scintillation system consisting of a sodium iodide crystal and a photomultiplier tube to measure gamma radiation. The Sodium Iodide crystal in the spectral gamma probe is large to measure low count rates.

The spectral gamma probe is able to measure gamma radiation with specific energy windows. The target energy windows are for K^{40} , TH^{232} and $U^{232-238}$ so that specific curves are generated for each isotope. The scintillation system is temperature compensated to avoid measurement drift. A small Cs^{137} source is used for spectral gamma energy window quality assurance at each borehole.

Ideally suited for:

Uranium exploration and mining.
Sedimentary studies.

Operations & Calibration:

Minimum borehole diameter of 75mm.
Air and/or fluid filled borehole.
Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 1.5 m/min.

Final curve units can be counts per second, uranium grade in %eU₃O₈ or ppm_eU₃O₈, percentage K, U and TH

Calibration via Adelaide Models – AM6.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

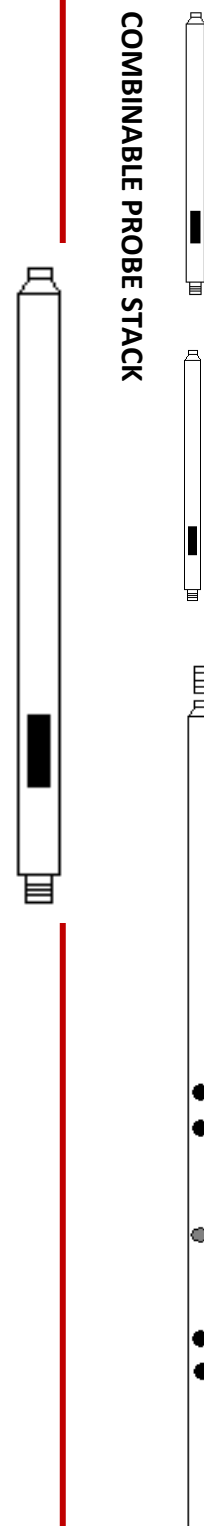
Gamma, filtered gamma, magnetic deviation, caliper, fluid temperature and conductivity.

PHYSICAL SPECIFICATIONS

Weight	7.0kg
Length	0.90m
Diameter	60mm
Crystal size	50mm x 150mm
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE

COMBINABLE PROBE STACK

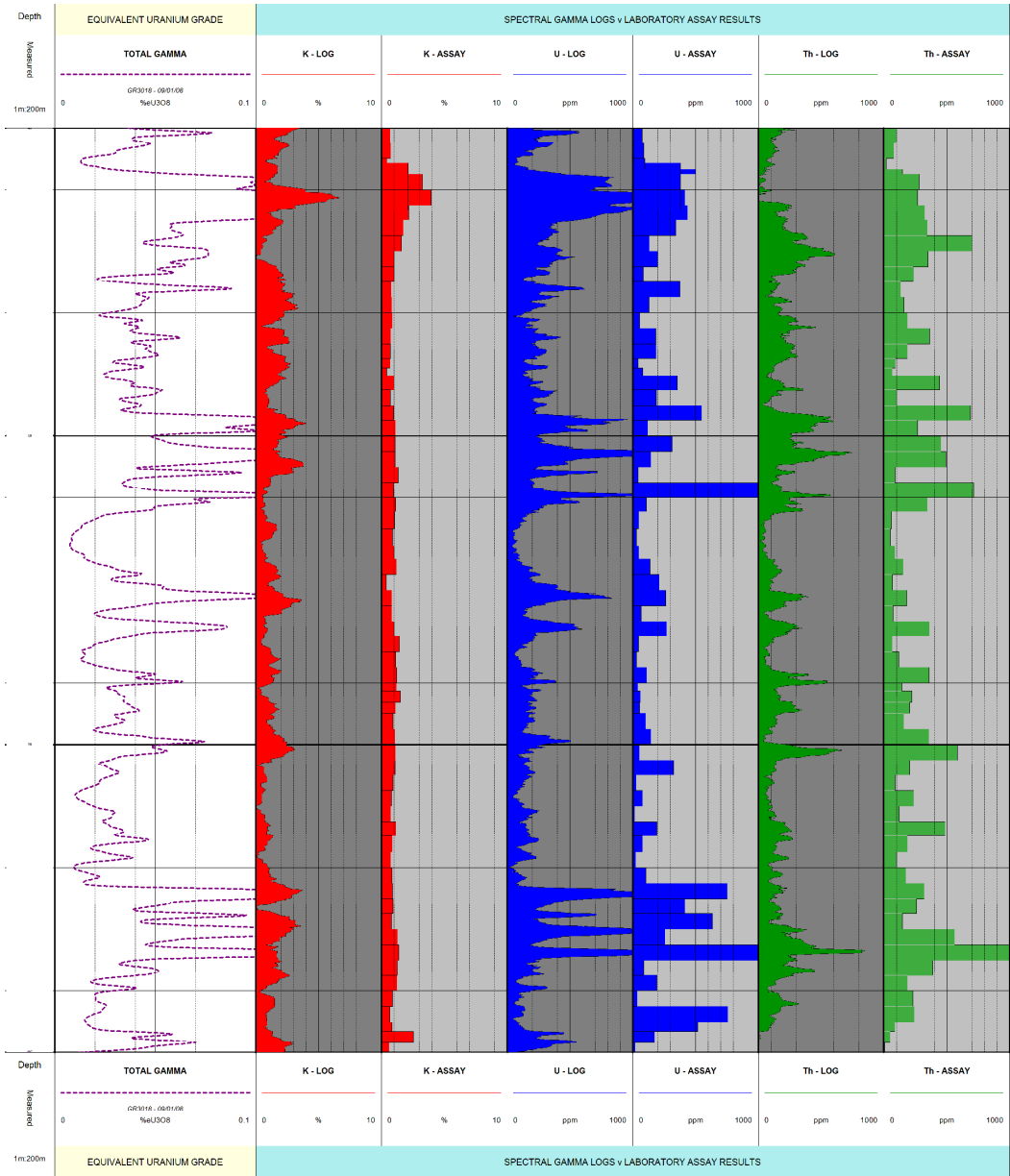


GEOPHYSICAL LOGGING PROBES

Spectral Gamma

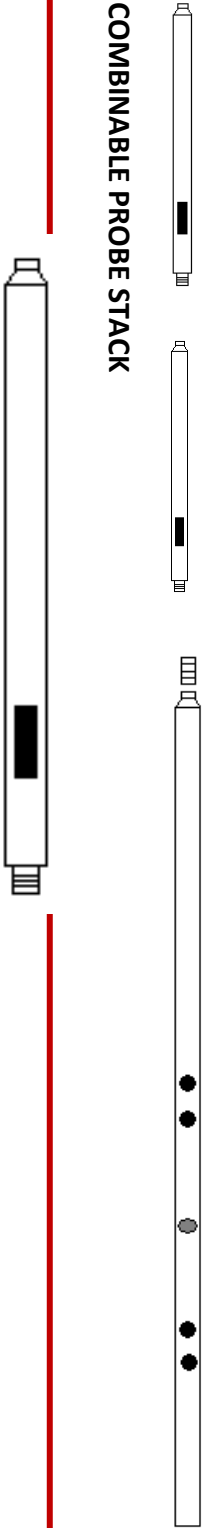
SGAM

SPECTRAL GAMMA LOGS v LABORATORY ASSAYS



SINGLE PROBE

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Formation Density (Dual Spacing)

FDSB

MEASUREMENT PRINCIPLE

The formation density probe uses a small Cs^{137} or Co^{60} radioactive source, as a source of gamma radiation, to energise the formation. Resulting back scatter with the formation is detected at two scintillation detectors spaced at different distances from the source. The amount of back scattered gamma radiation is inversely proportional to the apparent electron density of the formation.

To optimise quantitative density measurements the probe has a single arm caliper which is opened at the bottom of the logged interval. The caliper action pushes a thin, vertical detector window of the density detection section against the borehole wall. The remainder of the density detection section is covered by a dense collimated shield of lead and tungsten. This configuration reduces the environmental borehole effects upon the density measurement. There is an effective shield at the base of the probe to prevent gamma radiation travelling directly from the source to the probe.

Ideally suited for:

- Coal and iron ore exploration and mining.
- Uranium exploration and mining.
- Geotechnical studies.
- Density assaying

Operations & Calibration:

- Minimum borehole diameter of 75mm.
- Quantitative density measurements in fluid filled borehole and open borehole conditions.
- Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.

Final curve units can be counts per second, grams per cubic centimetre .
Calibration via Adelaide Models – AM8 and AM11, and specific project borehole when density assay data is available.

Probes can be stacked to the top of the probe. Typical combinations are:
Gamma, gamma and magnetic deviation.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

PHYSICAL SPECIFICATIONS

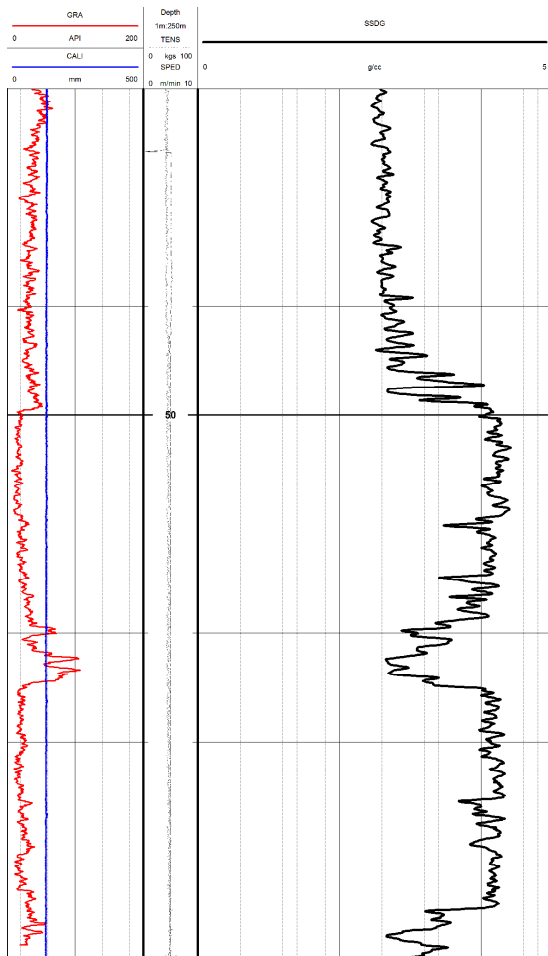
Weight	25.0kg
Length	1.92m
Diameter	60mm
Density Detectors	LSD(48cm), SSD(25cm),
Caliper range & accuracy	350mm & +/- 5mm
Source	Cs^{137} - COAL, Co^{60} —IRON ORE
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

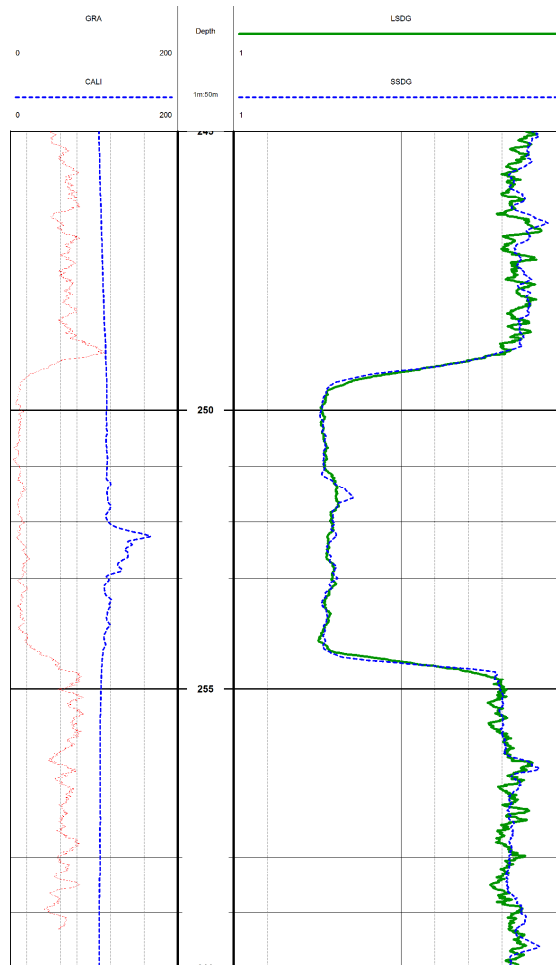
Formation Density (Dual Spacing)

FDSB

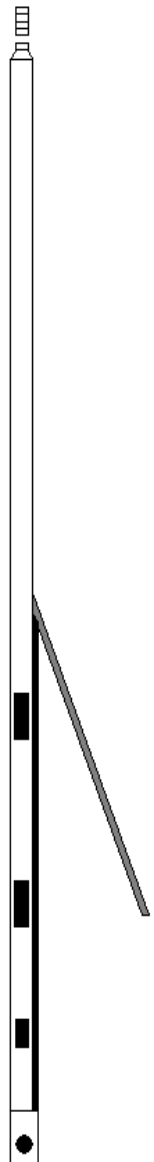
IRON ORE



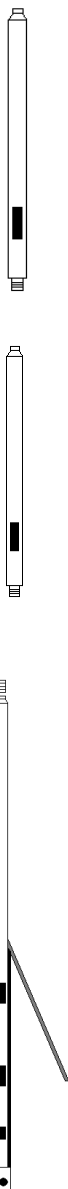
COAL



SINGLE PROBE RUN



COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Formation Density & Resistivity (Triple Spacing)

FDSC

MEASUREMENT PRINCIPLE

The formation density probe uses a small Cs^{137} or Co^{60} radioactive source, as a source of gamma radiation, to energise the formation. Resulting back scatter with the formation is detected at three scintillation detectors spaced at different distances from the source. The amount of back scattered gamma radiation is inversely proportional to the apparent electron density of the formation.

To optimise quantitative density measurements the probe has a single arm caliper which is opened at the bottom of the logged interval. The caliper action pushes a thin, vertical detector window of the density detection section against the borehole wall. The remainder of the density detection section is covered by a dense collimated shield of lead and tungsten. This configuration reduces the environmental borehole effects upon the density measurement. There is an effective shield at the base of the probe to prevent gamma radiation travelling directly from the source to the probe.

This density probe has a single focussed resistivity electrode for qualitative resistivity of the formation. This makes the probe a very effective multi-parameter logging tool.

Ideally suited for:

- Coal and iron ore exploration and mining.
- Uranium exploration and mining.
- Geotechnical studies.
- Density assaying.

Operations & Calibration:

- Minimum borehole diameter of 60mm.
- Quantitative density measurements in fluid filled borehole and open borehole conditions.
- Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.

Final curve units can be counts per second, grams per cubic centimetre and ohm-metres
Calibration via Adelaide Models – AM8 and AM11, and specific project borehole when density assay data is available.

Probes can be stacked to the top of the probe. Typical combinations are:
Gamma, gamma and magnetic deviation.

PHYSICAL SPECIFICATIONS

Weight	30.0kg
Length	2.59m
Diameter	60mm
Density Detectors	LSD(48cm), SSD(25cm), BRD(14cm)
Caliper range & accuracy	350mm & +/- 5mm
Focussed resistivity	1—1000 OHMM
Source	Cs^{137} - COAL, Co^{60} —IRON ORE
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE

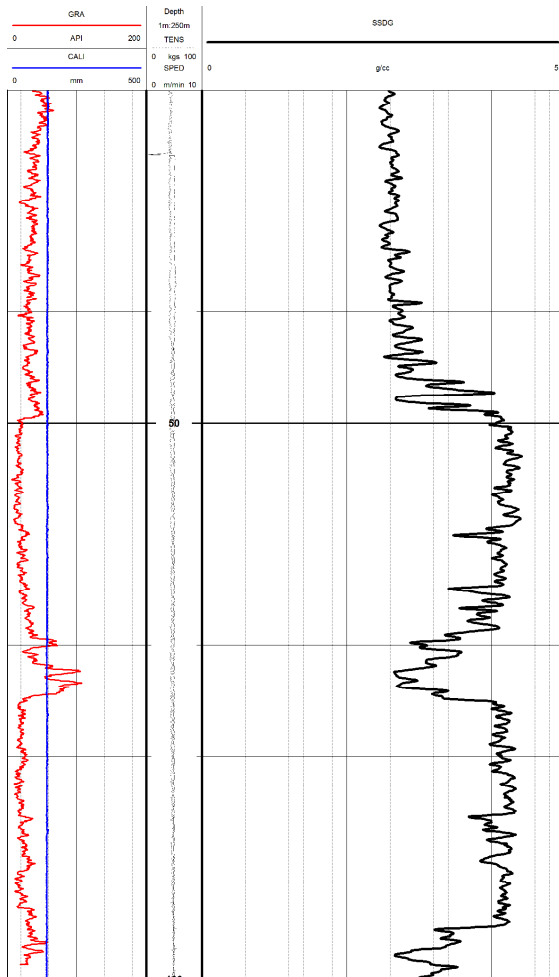
COMBINABLE PROBE STACK

GEOPHYSICAL LOGGING PROBES

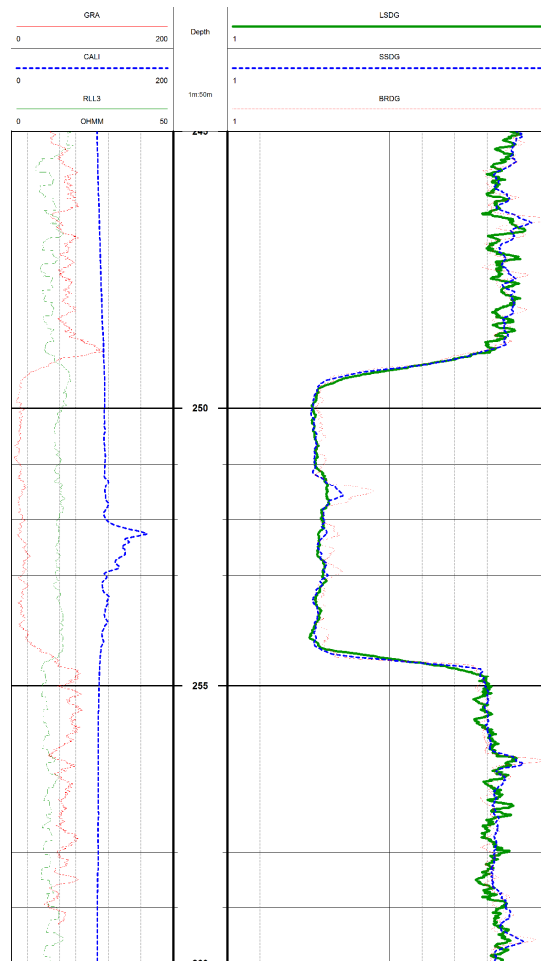
Formation Density & Resistivity

FDSC

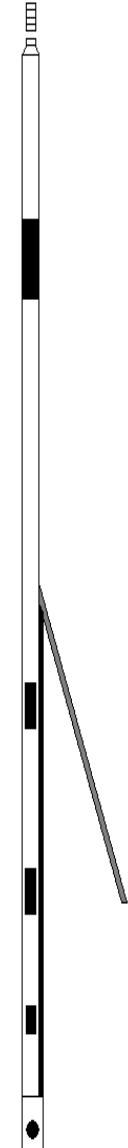
IRON ORE



COAL



SINGLE PROBE



COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Dual Density Trisonde (Side Loading Source)

DGGD

MEASUREMENT PRINCIPLE

The dual density trisonde probe uses either a Cs^{137} or Co^{60} radioactive source, as a source of gamma radiation, to energise the formation depending upon the geological environment. The slim design allows the use of the probe within RC drill rods. Resulting back scatter in the formation is detected at both scintillation detectors allowing compensation of the density data. The amount of back scattered gamma radiation is inversely proportional to the apparent electron density of the formation. Data processing allows identification of formation versus caving behind the drill rods.

Logging inside the drill rods provides a safer environment for the radioactive source compared to the open-hole and allows coverage where the borehole has collapsed.

Ideally suited for:

Inrod density logging.

Operations & Calibration:

Minimum drill rod diameter of 50mm.

Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.

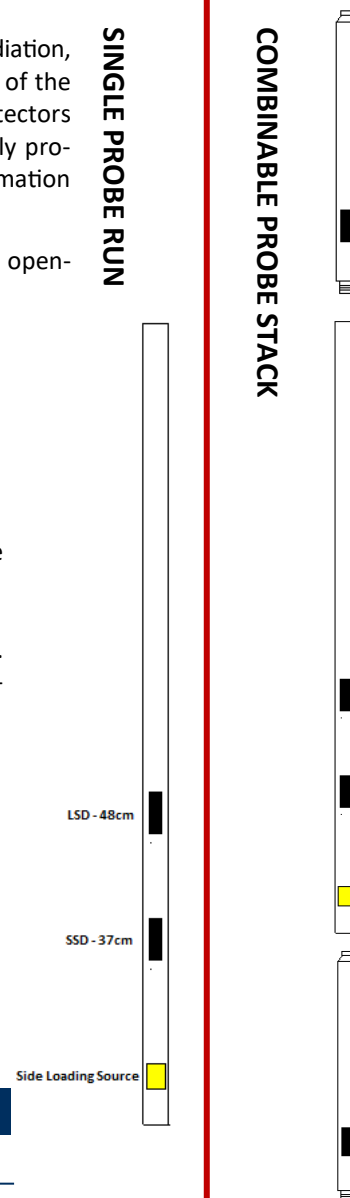
The side loading radioactive source design allows for probe “stacking” below the source, giving the possible acquisition of gyro and gamma data in a single logging run.

Final curve units can be counts per second, grams per cubic centimetre with density compensation. Calibration via Adelaide Models – AM8 and AM11, and specific project borehole when density assay data is available.

Probes can be stacked above and below the probe. Typical combinations are:
Gamma, dual density and North Seeking Gyro.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

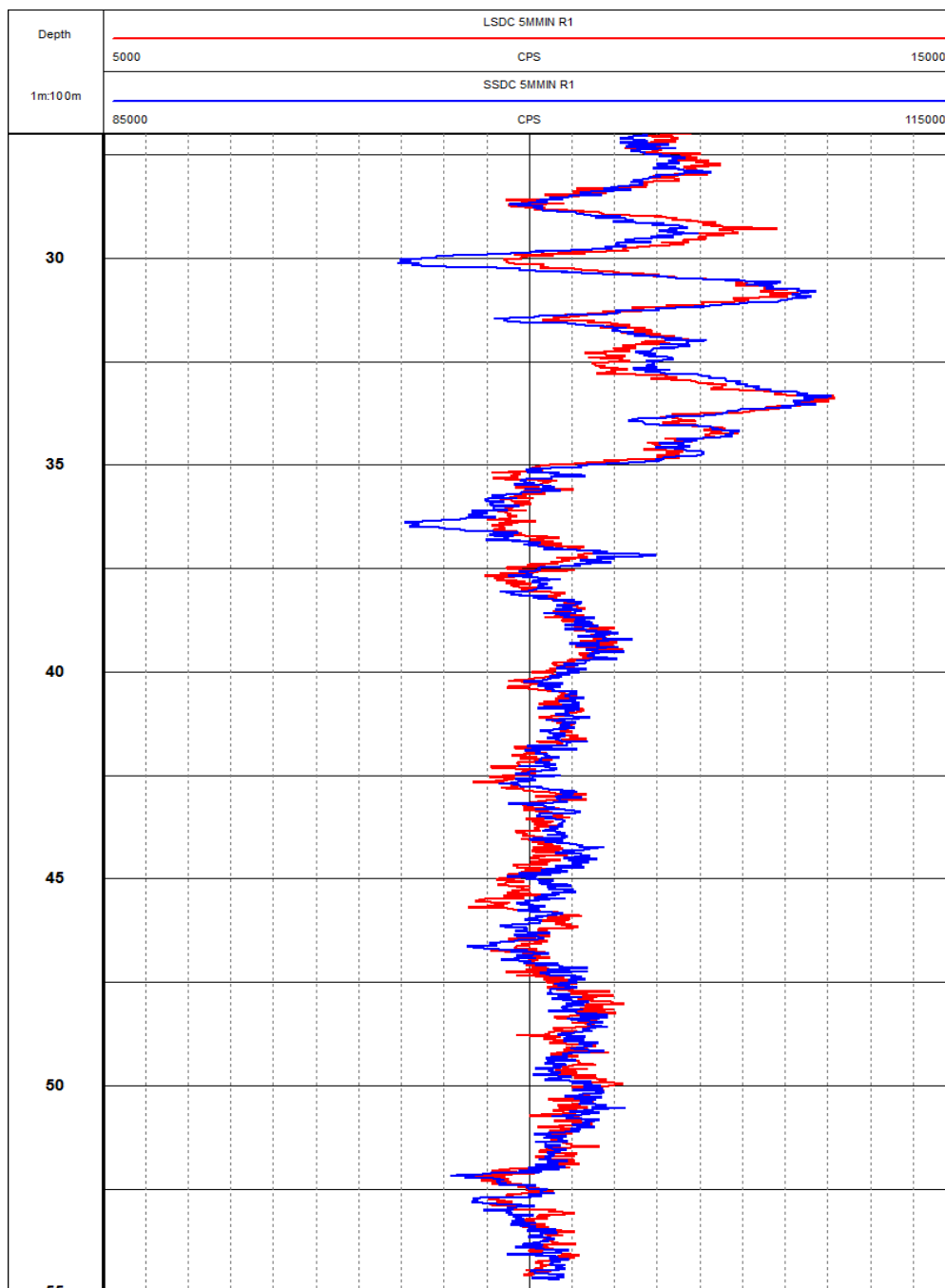
**PHYSICAL SPECIFICATIONS**

Weight	10.0kg
Length	1.42m
Diameter	42mm
Density Detectors	LSD (48cm), SSD (37cm)
Source	Co^{60} or Cs^{137}
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

Dual Density Trisonde (Side Loading Source)

DGGD



SINGLE PROBE RUN

COMBINABLE PROBE STACK

LSD - 48cm
SSD - 37cm
Loading Source



GEOPHYSICAL LOGGING PROBES

Dual Neutron Porosity

DNNS

MEASUREMENT PRINCIPLE

The dual neutron employs a 3 curie Americium-Beryllium (Am-Be) source to generate neutrons which interact with the formation. The thermal neutrons generated through this process are detected by two helium³ proportional detectors. Hydrogen, present as water in pore spaces or within clay minerals, is a very effective moderator of the neutrons emitted from the Am-Be source such that the dual neutron is an effective measure of porosity in the formation.

The dual neutron uses the ratio of the long and short neutron detectors to calculate a Hydrogen Index which allows for compensation of borehole conditions and hence the accurate measurement of formation porosity.

Ideally suited for:

- Coal exploration and mining.
- Groundwater investigations - porosity.
- Uranium exploration and mining – ISL mining.

Operations & Calibration:

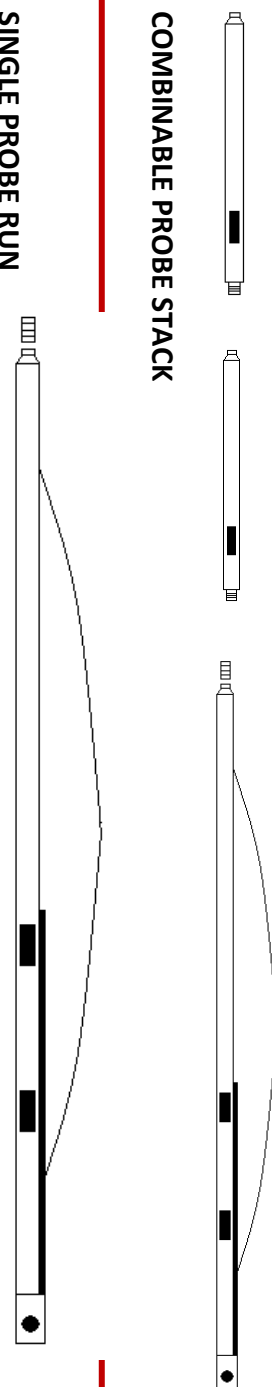
- Minimum borehole diameter of 75mm.
- Fluid filled borehole – for quantitative porosity measurements.
- Open borehole and/or steel cased borehole.
- Typically recorded in an uphole logging direction at logging speeds of 3 - 5 m/min. (Downhole logging can be recorded for QA purposes).
- Final curve units can be counts per second, % porosity based upon a specific matrix.
- Calibration is undertaken at the Adelaide Models.
- Probes can be stacked to the top of the probe. Typical combinations are:
Gamma, gamma and magnetic deviation.

PHYSICAL SPECIFICATIONS

Weight	23.0kg
Length	1.60m
Diameter	66mm
Neutron Detectors	LSN, SSN (Helium proportional)
Source	²⁴¹ Am-Be 111 GBq
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE RUN

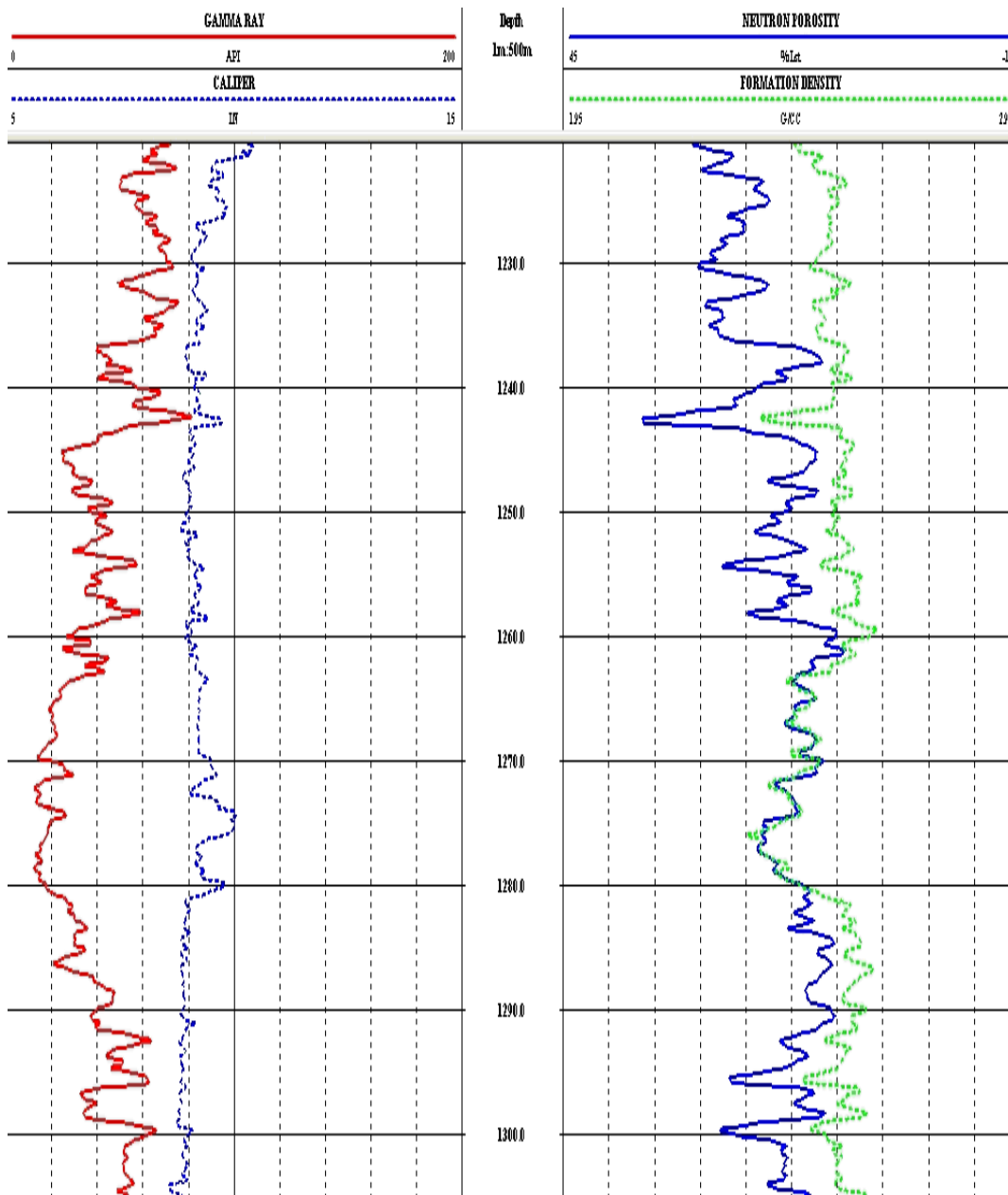
COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Dual Neutron Porosity

DNNS



SINGLE PROBE RUN



COMBINABLE PROBE STACK



PROBES

FORMATION CHARACTERISATION ELECTRICAL & MAGNETIC.

- Resistivity: Dual Laterolog (Focussed Resistivity)
- Conductivity: Dual Induction (Conductivity)
- Magnetic Resonance: Borehole Magnetic Resonance (BMR)
- Magnetic Susceptibility:
- Induced Polarisation: IP
- Spontaneous Potential: SP

GEOPHYSICAL LOGGING PROBES

Dual Laterolog (Focused Resistivity)

DLL3

MEASUREMENT PRINCIPLE

The dual laterolog (focused resistivity) probe forces electrical current to flow into the formation as a “sheet” perpendicular to the probe. The “sheet” form of the electrical current allows deep penetration into the formation and a resolution of thin horizons in the formation allowing excellent values of true formation resistivity to be measured and thin beds thickness to be identified.

The dual laterolog provides short (RLLS) and deep focussed (RLLD) resistivity curves which have much greater vertical resolution of boundaries compared to traditional resistivity probes. The probe has a large dynamic measurement range.

Ideally suited for:

Coal, iron ore and uranium exploration.
Groundwater investigations.
Contamination studies.

Operations & Calibration:

Minimum borehole diameter of 50mm.
Fluid filled borehole.
Open borehole conditions.

Typically recorded in an uphole logging direction at logging speeds of 5 – 7 m/min.
(Downhole logging can be recorded for QA purposes)

Final curve units can be counts per second, ohm-metres (OHMM) .
Calibration via resistivity calibration jig.

Typically run with an insulated bridle if Spontaneous Potential (SP) required.

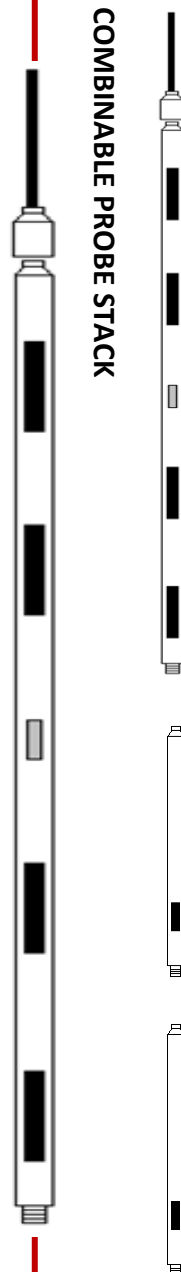
Probes can be stacked to the bottom of the probe. Typical combinations are:
Gamma, gamma & magnetic deviation, magnetic susceptibility, dual induction.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

PHYSICAL SPECIFICATIONS

Weight	8.0kg
Length	2.37m
Diameter	38mm
Resistivity	1—10000 OHMM
Maximum Pressure	20 MPa
Maximum Temperature	80°C

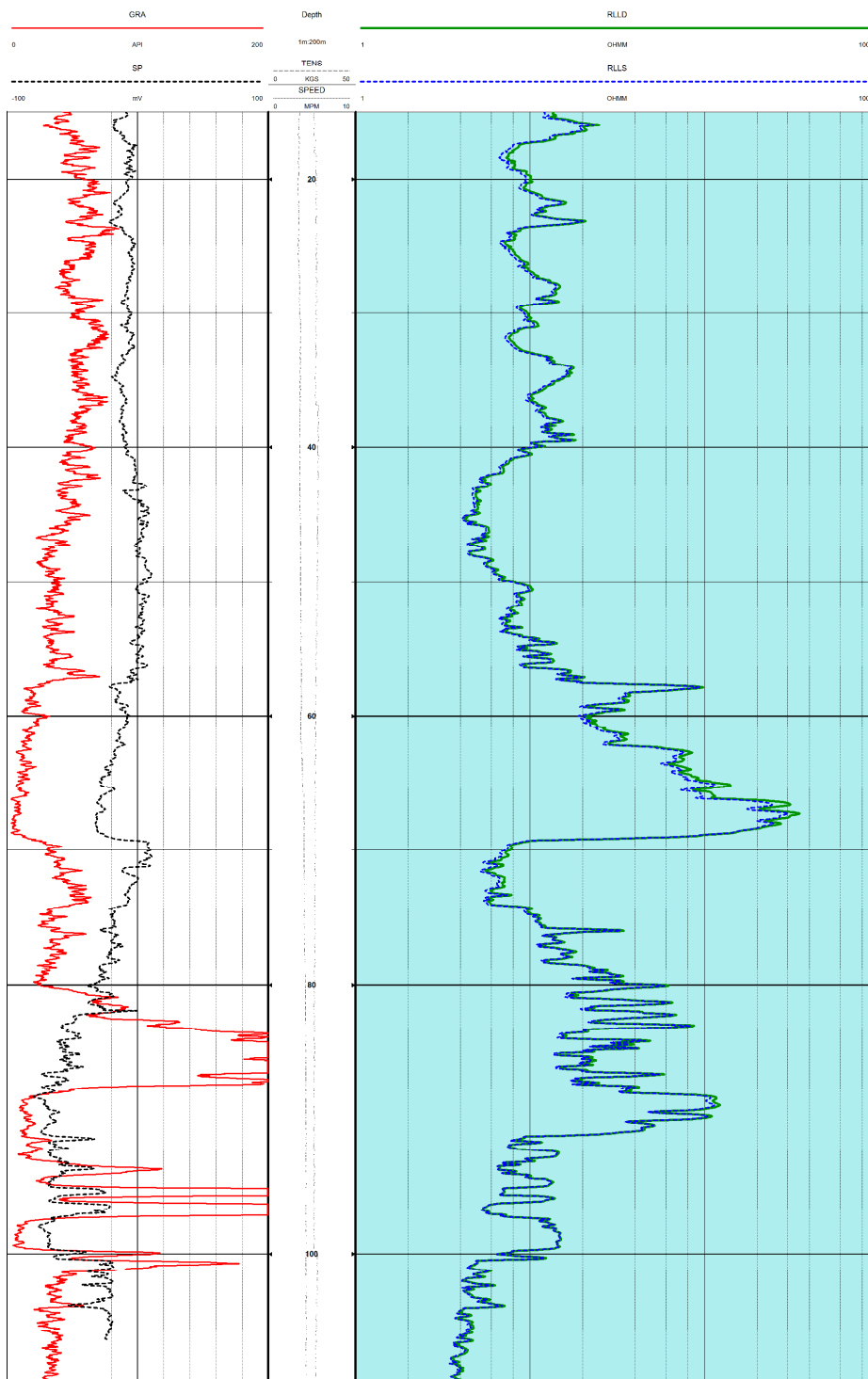




GEOPHYSICAL LOGGING PROBES

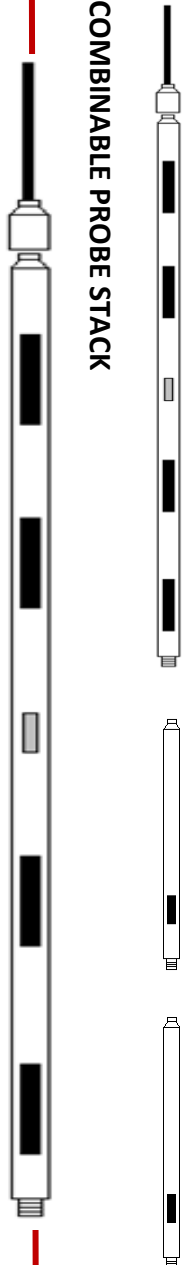
Dual Laterolog (Focused Resistivity)

DLL3



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Dual Induction (Conductivity)

EM50

MEASUREMENT PRINCIPLE

The dual induction/conductivity probe generates an electromagnetic field in the vicinity of the borehole and measures the response of the formation to this applied field.

Medium and deep induction/conductivity curves are recorded. The probe can operate in either air filled or fluid openhole boreholes as well cased PVC cased boreholes. The optimum probe operating conditions is in high conductivity (low resistivity) formation.

Ideally suited for:

- Groundwater investigations – saline monitoring.
- Iron ore exploration and mining.
- Contamination studies.
- Base metals exploration and mining.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or PVC cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 7 – 8 m/min.
(Downhole logging can be recorded for QA purposes).

Final curve units can be counts per second, milli siemens per metre, milli-mohms per metre.
Calibration via conductivity rings.

Probes can be stacked to the top of the probe. Typical combinations are:

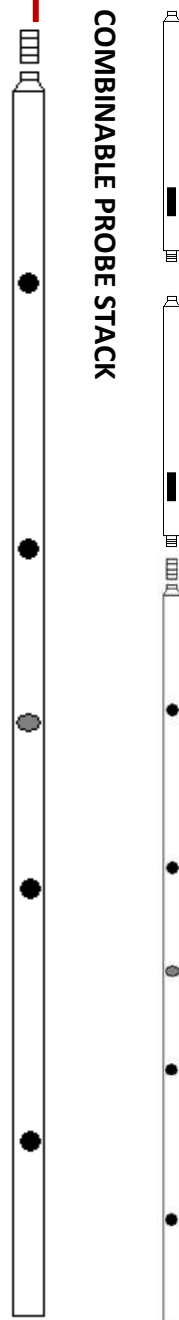
Gamma, gamma & magnetic deviation, dual laterolog.

PHYSICAL SPECIFICATIONS

Weight	5.0kg
Length	1.70m
Diameter	45mm
TX-RX Spacing	15cm & 40cm
Frequency	25 kHz
Conductivity range	1—3000 mS/m
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE RUN

COMBINABLE PROBE STACK

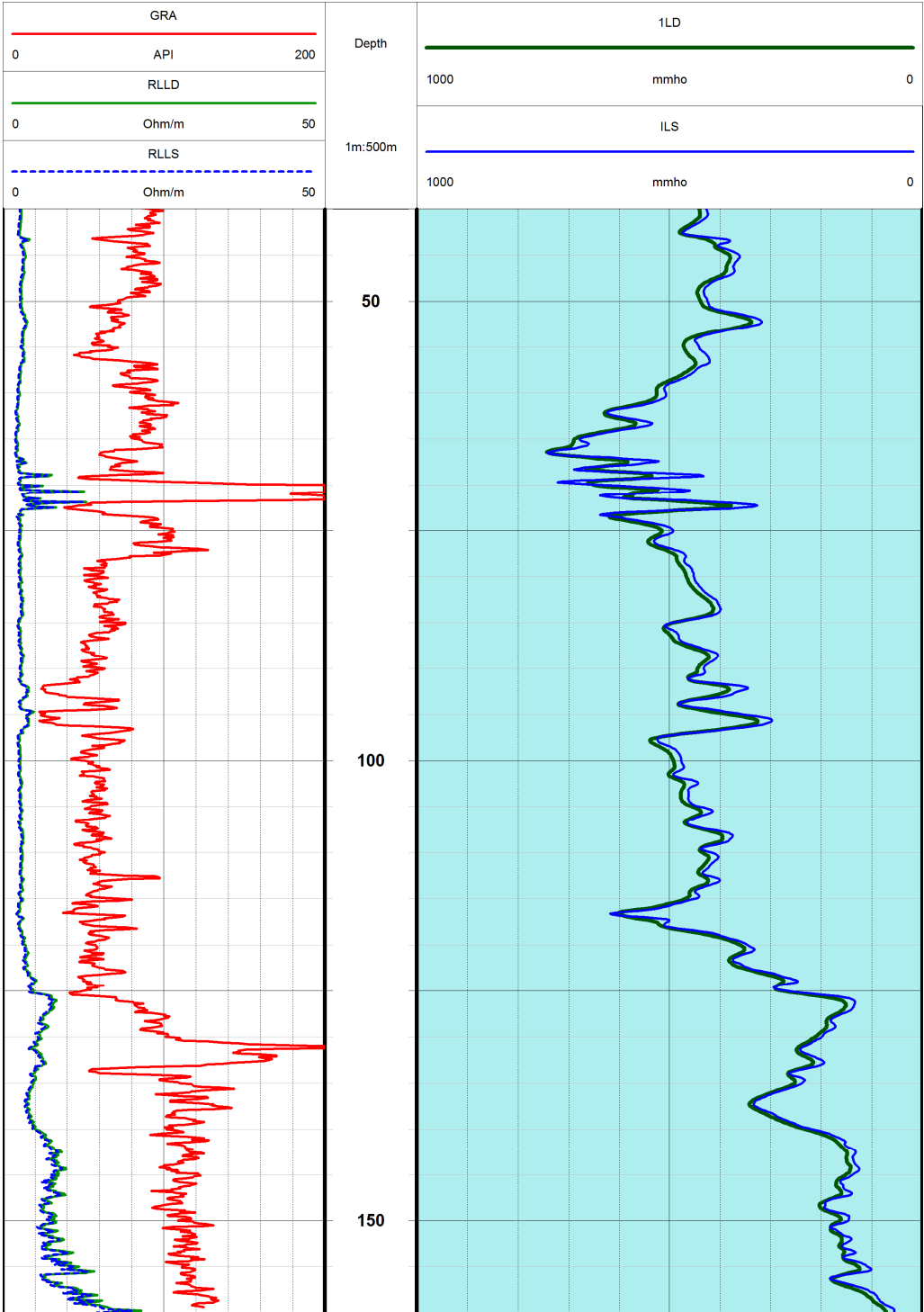




GEOPHYSICAL LOGGING PROBES

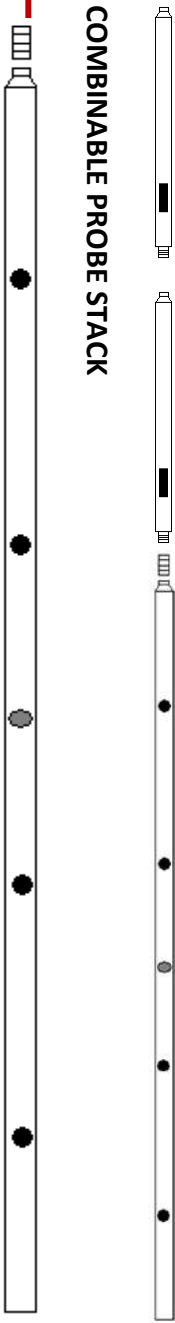
Dual
Induction (Conductivity)

EM50



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Borehole Magnetic Resonance

BMR

SINGLE PROBE RUN

MEASUREMENT PRINCIPLE

Borehole Magnetic resonance (BMR) logging makes use of strong permanent magnets and a weak oscillating magnetic field from precisely timed bursts of electromagnetic (EM) energy at specific radio frequencies (RF). Between these pluses an antenna is used to detect decaying spin-echo signals from hydrogen nuclei in resonance with the permanent magnetic field.

These signals are processed to characterize the pore structure of rocks in much the same way as Magnetic Resonance Imaging (MRI) is used to interrogate the interior structure of the human body. BMR is specifically tuned to sense pore network fluids only, enabling precise determination of rock total porosity (moisture content), mobile fluid content, specific yield, bound fluid content (specific retention) and permeability (hydraulic conductivity). BMR can also distinguish fluid types, with advanced analysis techniques developed to quantify both adsorbed gas content and free gas content of coals.

This unique logging technique eliminates the need for porosity measuring techniques which employ radioactive sources and the results are independent of lithology.

Applications:

- Mapping moisture content, specific yield and dry weight density.
- Dewatering projects in open and/or underground mining.
- Aquifer hydrogeology to guide a comprehensive groundwater management strategy.
- Brine hydrogeology to determine economic viability and shape a development strategy.
- Map coal seam gas content and permeability distribution for mine development planning.
- Identify hydrocarbon contamination for environmental clean up operations.

Features:

- Advanced pulse sequences allow high degree of precision & accuracy..
- Real time parameter views.
- Large depth of investigation due to impressive signal to noise ratio.
- Continuous mapping of parameters at a logging rate of 1—2 m/min.

PHYSICAL SPECIFICATIONS

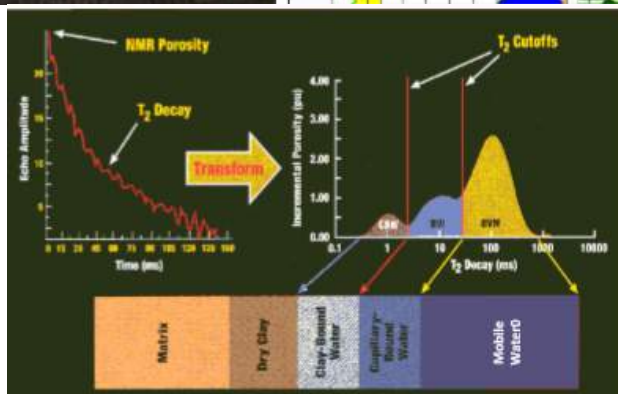
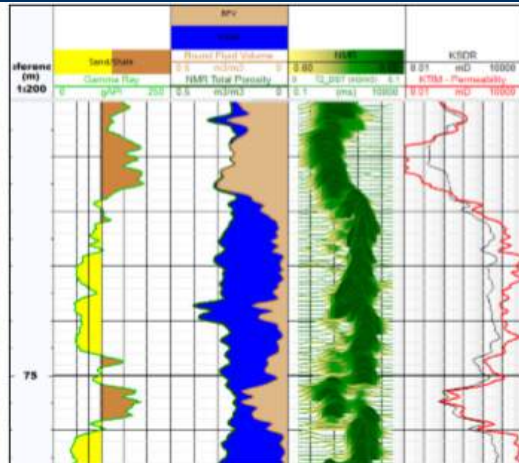
	BMR60	BMR90
Length	2.01m	2.04m
Weight	60mm	90mm
Diameter	15kg	20kg
Max. Pressure	100°C	100°C
Max. Temperature	200bar	90bar
Vertical Resolution	8cm	10cm
Investigation Zone	190 - 260mm	300mm
Echo Spcaing (TE)	320/600µs	320µs
Wait Time (TW)	Multi	Multi
T2 Distortion	0.5 x TE - 5 secs	0.5 x TE - 5 secs
Porosity Range	0 - 100 pu	0 - 100 pu
Total Porosity Precision	2 pu	2 pu
Hole Size	75 - 216mm	122 - 250mm
Hole Condition	Open/PVC CASED	Open/PVC CASED

GEOPHYSICAL LOGGING PROBES

Borehole Magnetic Resonance

BMR

SINGLE PROBE RUN



	BMR Logging	Conventional Logging	Packer Testing	Core Retrieval & Testing
In-situ measurement	✓	✓	✓	✗
Measurement accuracy ¹	✓✓✓✓	✓	✓✓✓	✓✓
Total porosity	✓	✓	✗	✓
Free water porosity	✓	✗	✗	✓
Clay-bound porosity	✓	✗	✗	✗
Capillary-bound porosity	✓	✗	✗	✓
Permeability	✓	✓	✓	✓
Real-time data	✓	✓	✗	✗
Continuous depth profile	✓	✓	✗	✗
Rig-less operation	✓	✓	✗	✗
Crane-free operation	✓	✗	✗	✓
Test speed ¹	✓✓✓✓	✓✓✓	✓✓	✓
Test efficacy ¹	✓✓✓✓	✓✓✓	✓✓	✓
Test cost ²	\$	\$\$	\$\$\$\$	\$\$\$
Cost benefit ranking	1	2	4	3

NOTES

- ✓ = worst, ✓✓✓✓ = best
- \$ = least costly, \$\$\$\$ = most costly

GEOPHYSICAL LOGGING PROBES

Induced Polarisation

IPTM

MEASUREMENT PRINCIPLE

Induced polarisation (IP) is a current stimulated electrical phenomenon which is observed as a delayed voltage response in the formation. The IP probe measures apparent formation chargeability by detecting the presence of conductive minerals through electrical polarisation where a conductive mineral is in contact with an ionic conducting pore fluid.

The IP measurements can also be used to detect the presence of clay minerals in the formation through membrane polarisation.

Ideally suited for:

Iron ore exploration and mining.
Base metal exploration and mining

Operations & Calibration:

Minimum borehole diameter of 50mm.
Fluid filled borehole.
Open borehole conditions.

Typically recorded in an uphole logging direction at logging speeds of 3 m/min.
(Downhole logging can be recorded for QA purposes).

Final curve units can be counts per second, ohm-metres, milliamps.
Calibration via IP calibration jig.

Probes can be stacked to the top of the probe. Typical combinations are:
Gamma, gamma and magnetic deviation.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

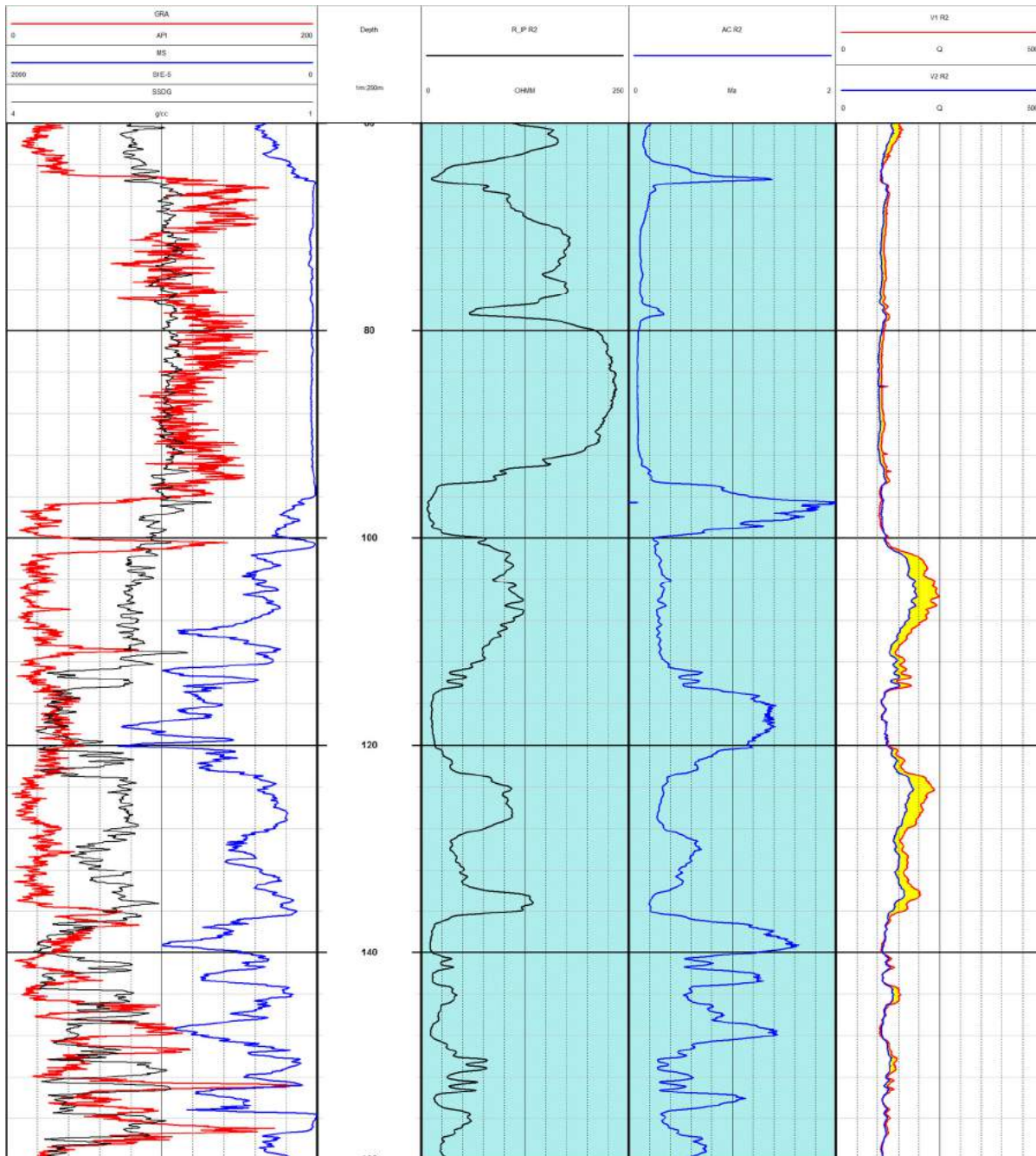
PHYSICAL SPECIFICATIONS

Weight	7.0kg
Length	1.80m
Diameter	45mm
Electrode spacing	40cm (Wenner Array)
Measurement	Time Domain (220 ms cycles)
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

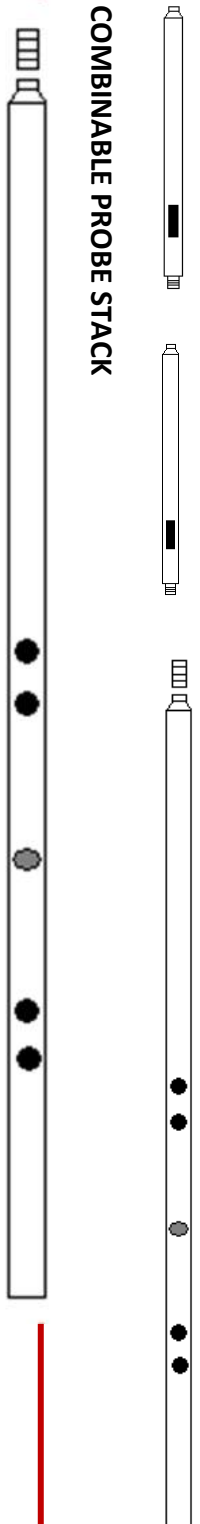
Induced Polarisation

IPTM



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Magnetic Susceptibility

MSUS

MEASUREMENT PRINCIPLE

Magnetic susceptibility is a measure of the degree to which a rock may be magnetised. The probe has a transmitter, a receiver coil and produces an oscillating magnetic field which induces primary and secondary currents in the rock surrounding the borehole. The secondary field is measured at the receiver coil where the “in phase” component represents the magnetic susceptibility.

The transmitter coil frequency is 2 KHz and the receiver spacing is 25cm.

Ideally suited for:

- Identification of magnetic ground.
- Iron Ore exploration and mining.
- Magnetite exploration and mining.
- Base metals exploration and mining.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air or fluid filled borehole.
- Normally run in open borehole conditions.
- Typically recorded in an uphole logging direction at logging speeds of 5 – 7 m/min.
- (Downhole logging can be recorded for QA purposes)

Final curve units can be counts per second or SI E-5 units.

Calibration via magnetic blocks and/or local project borehole.

Probes can be stacked to the top of the probe. Typical combinations are:
Gamma, gamma & magnetic deviation, dual laterolog.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

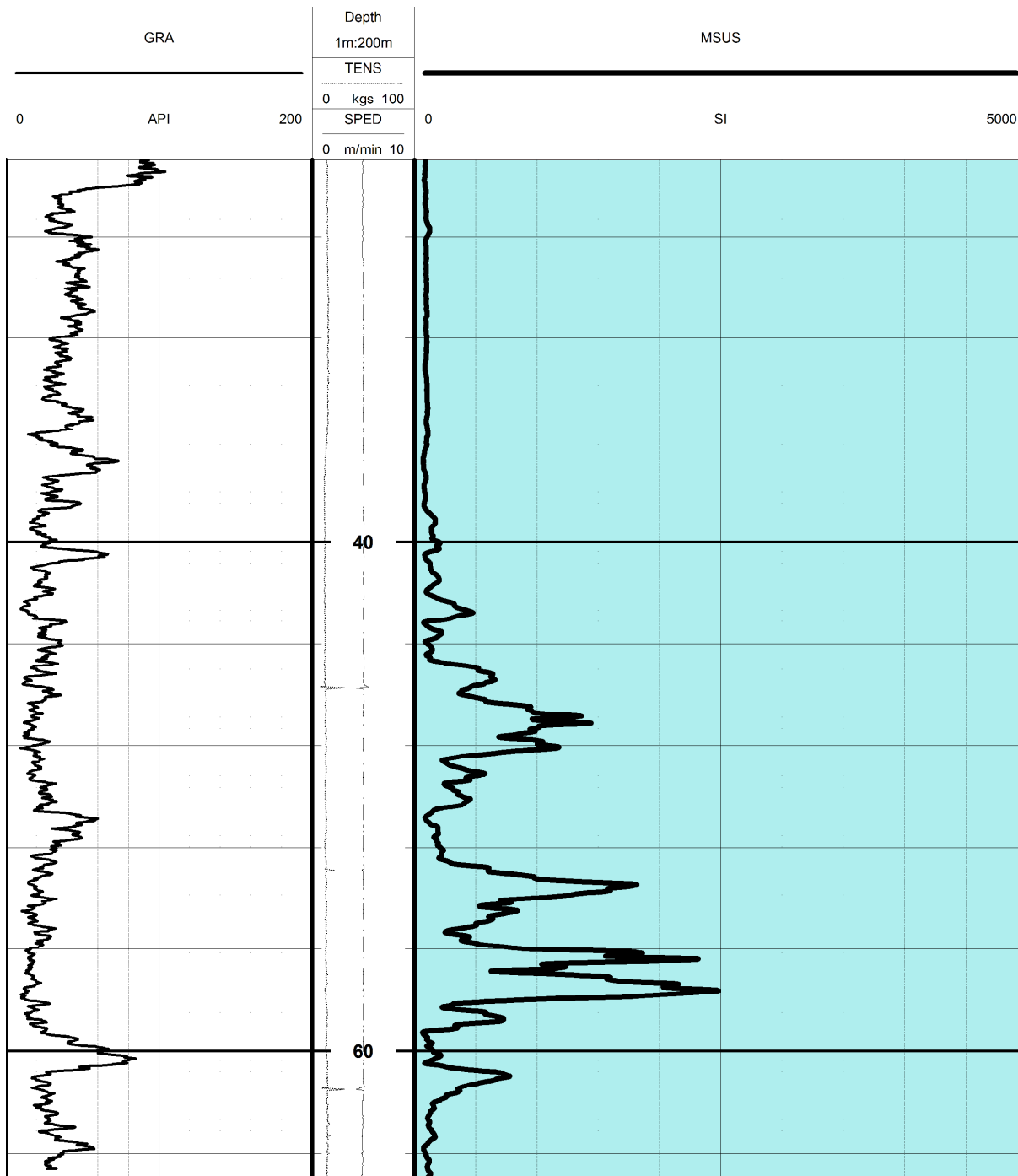
PHYSICAL SPECIFICATIONS

Weight	5.0kg
Length	1.05m
Diameter	45mm
TX—RX Spacing	25cm
Frequency	2kHz
Susceptibility Range	1x10 ³ to 1 SI Units
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

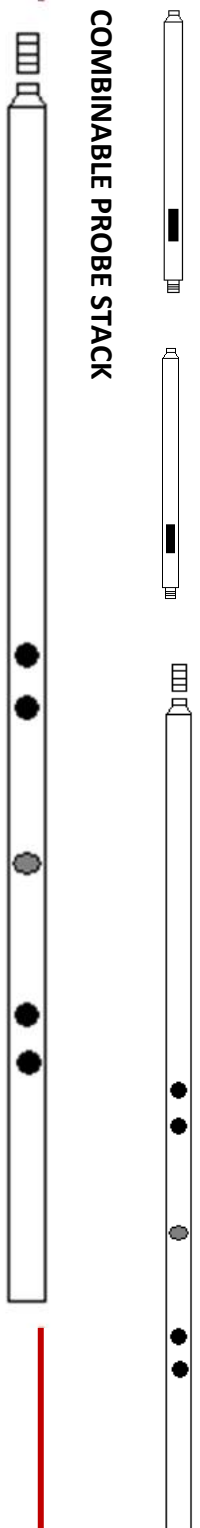
Magnetic Susceptibility

MSUS



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Spontaneous Potential (SP)

SPP

MEASUREMENT PRINCIPLE

Spontaneous Potential (SP) is measured with an insulated bridge attached to the dual laterolog probes and an earthing stake at the surface. The SP is a measure of the voltage change between an electrode in the insulated bridge and the surface earthing stake.

Ideally suited for:

Coal, iron ore and uranium exploration.
Groundwater investigations.

Operations & Calibration:

Minimum borehole diameter of 50mm.
Fluid filled borehole.
Open borehole conditions.

Typically recorded in a downhole logging direction at logging speeds of 5 – 7 m/min.

Final curve units can be counts per second, millivolts.

Calibration via resistivity/SP calibration jig.

Insulated bridge on top of DLL3 probe.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

PHYSICAL SPECIFICATIONS

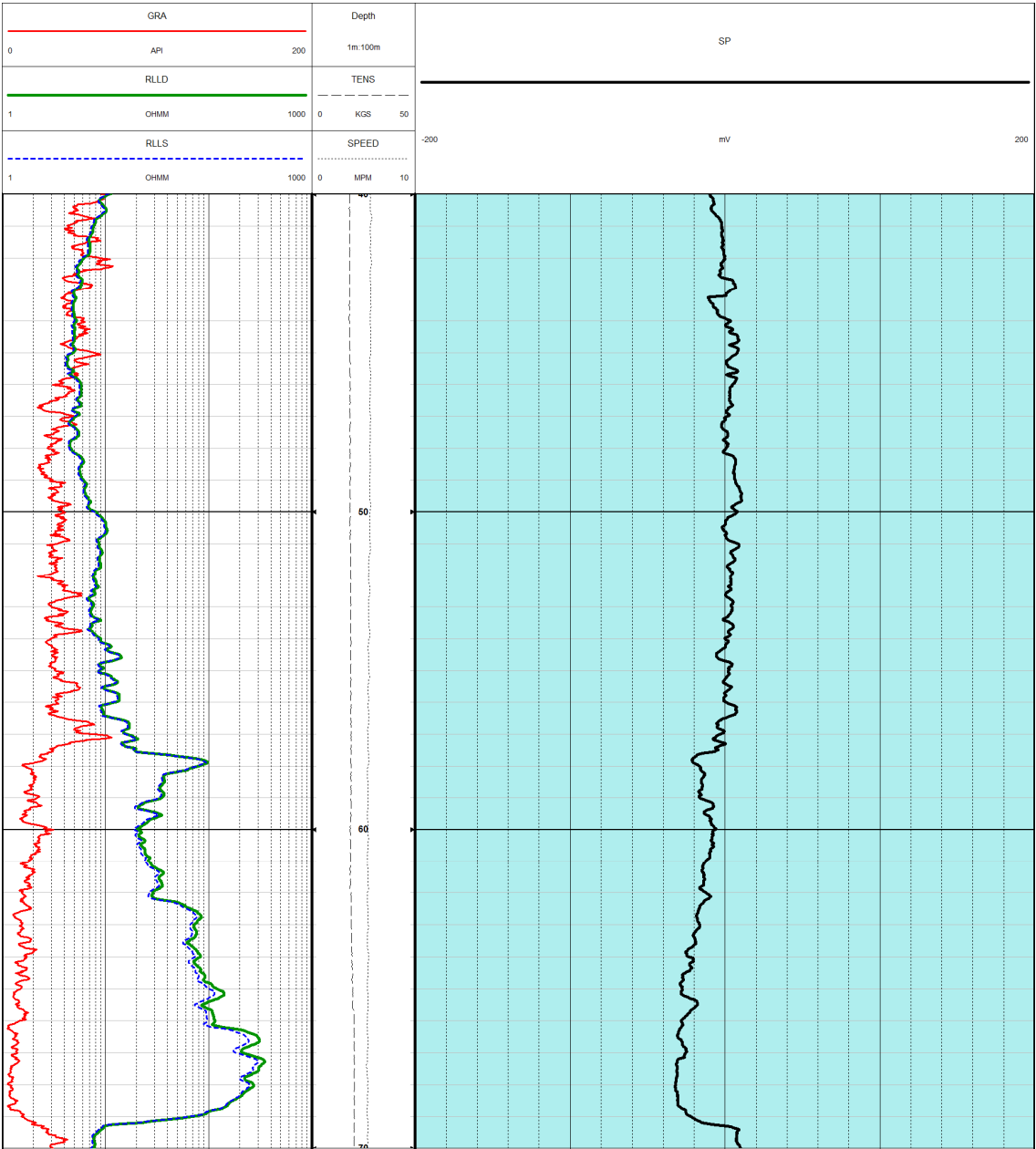
Weight	5.0kg
Length	5.0m or 10.0m
Diameter	38mm
Resistivity	-2.5 to +2.5 Volts
Maximum Pressure	20 MPa
Maximum Temperature	80°C



GEOPHYSICAL LOGGING PROBES

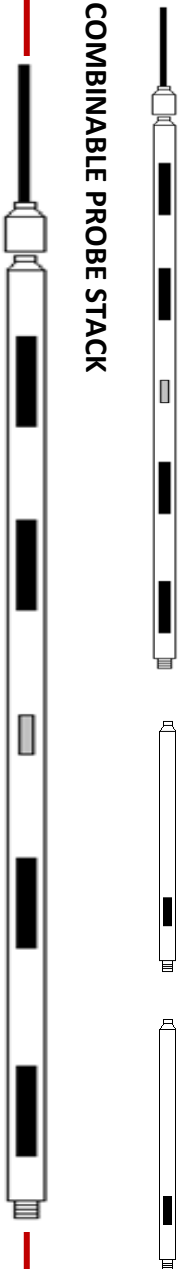
Spontaneous
Potential (SP)

SPP



SINGLE PROBE RUN

COMBINABLE PROBE STACK



PROBES

FORMATION CHARACTERISTICS — VELOCITY.

- Fullwave Sonic: 1 transmitter & 4 receivers
(60cm, 80cm, 100cm, 120cm receiver spacings)
- Suspension Seismic P & S Wave Measurement

GEOPHYSICAL LOGGING PROBES

Fullwave

Sonic 1TX-4RX

ASNC

MEASUREMENT PRINCIPLE

The probe measures the time taken for high frequency sound waves to travel from a transmitter to a series of receivers. The high frequency sound waves travel through the borehole fluid, along the borehole wall and back to an array of four receivers spaced at 20cm intervals, starting from 60cm from the transmitter. At each receiver the waveform is sampled according to a set of user definable parameters (sample rate, gain, threshold etc). The user defined parameters are controlled by the operator depending on the purpose of the survey (formation velocity, interval transit time, cement bond etc). As well as a log of formation velocity or interval transit time, the fullwave form for each receiver is recorded and made available to the client.

Data processing includes calculation of porosity, interval transit times for seismic survey depth conversions and shear wave picking for elastic rock properties (Poisson's Ratio, Young's Modulus etc) calculation.

Ideally suited for:

- Coal exploration and mining.
- Velocity control for seismic surveys.
- Cement bond logging of cased boreholes.

Operations & Calibration:

- Minimum borehole diameter of 60mm.
- Fluid filled borehole.
- Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 5 - 6 m/min.

(Downhole logging can be recorded for QA purposes).

Final curve units can be for transit time, microseconds per foot (or metre) and for velocity kilometres per second or metres per second.

Calibration is set by the manufacturer.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

Gamma, gamma and magnetic deviation.

PHYSICAL SPECIFICATIONS

Weight	17.0kg
Length	2.20m
Diameter	50mm
TX—RX Spacing	60, 80, 100, 120cm
Frequency	28kHz
Sampling	2 or 4 microseconds
Maximum Pressure	20 MPa
Maximum Temperature	80°C

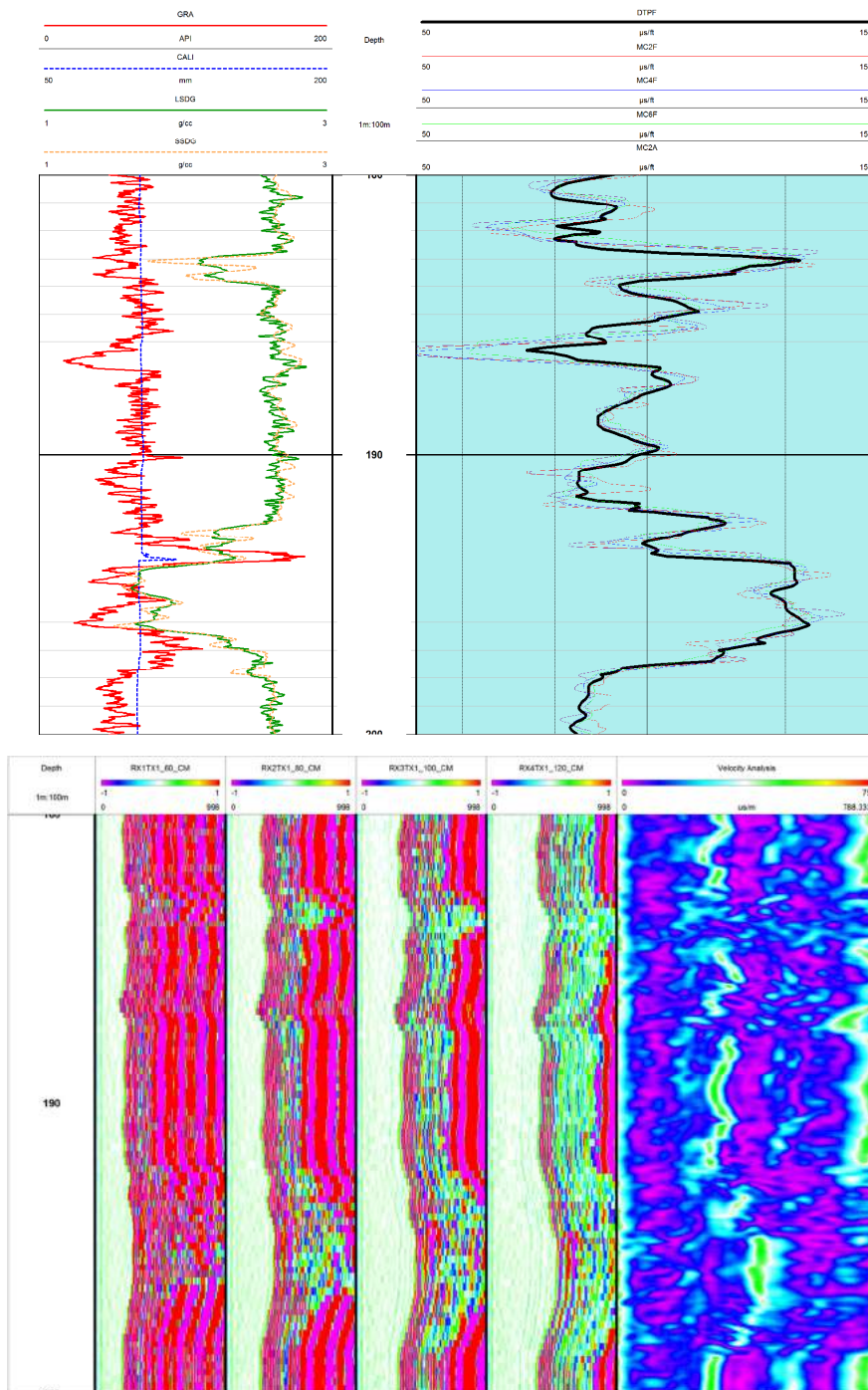
SINGLE PROBE RUN

COMBINABLE PROBE STACK

GEOPHYSICAL LOGGING PROBES

Fullwave
Sonic 1TX-4RX

ASNC



SINGLE PROBE RUN

COMBINABLE PROBE STACK

GEOPHYSICAL LOGGING PROBES

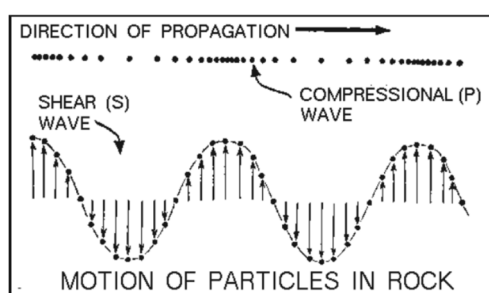
Seismic Suspension Probe

Compressional & Shear Wave Measurement

SEIS

MEASUREMENT PRINCIPLE

The probe measures the time taken for high frequency sound waves to travel from an energy source to a series of receivers. The source is a dipole source capable of produce acoustic energy in two directions and 180° out of phase. The energy pulse is directed perpendicular to the borehole wall and is capable of generating strong shear waves.



Measurements are made in an openhole or PVC cased borehole within a fluid filled section with the probe stationary. Receiver gains, time sampling periods and source energy levels are all configurable during logging.

Data processing includes picking the compressional and shear wave arrival at each station accurately, allowing further processing to elastic rock properties (Poisson's Ratio, Young's Modulus etc).

Ideally suited for:

- Geotechnical Investigation—ground conditions.
- Calculation of elastic rock properties.

Operations & Calibration:

- Minimum borehole diameter of 60mm.
- Fluid filled borehole.
- Open borehole and/or PVC cased borehole.

Stationary measurements.

SINGLE PROBE RUN

**PHYSICAL SPECIFICATIONS**

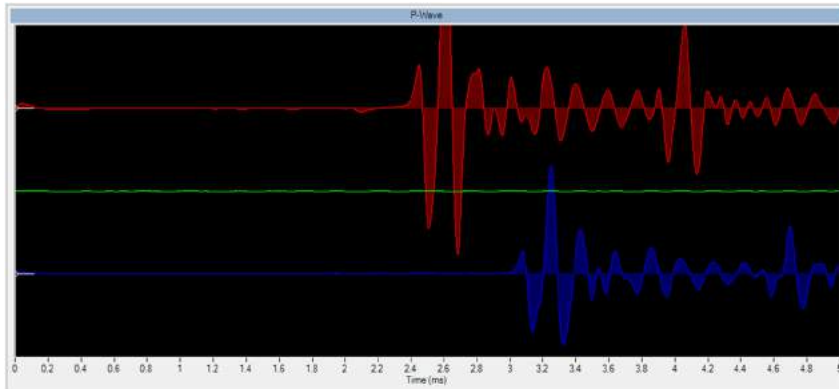
Weight	140kg
Length	4.1m (can be increased)
Diameter	50mm
RX Spacing	two receivers
Source	Dipole and directional
Sampling	User configured
Maximum Pressure	5 MPa
Maximum Temperature	50°C

GEOPHYSICAL LOGGING PROBES

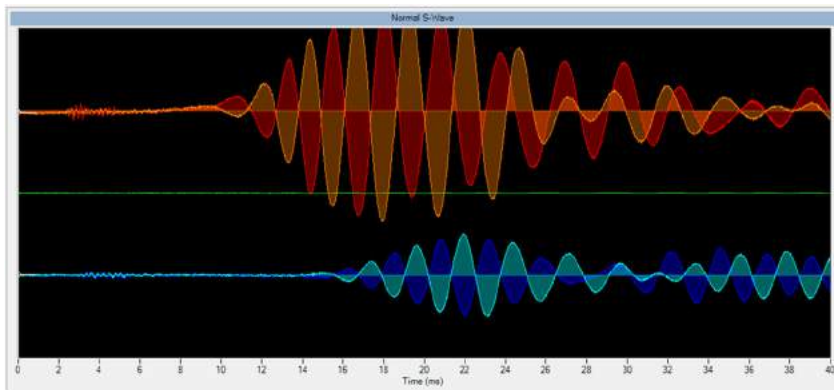
Seismic Suspension Probe Compressional & Shear Wave Measurement

SEIS

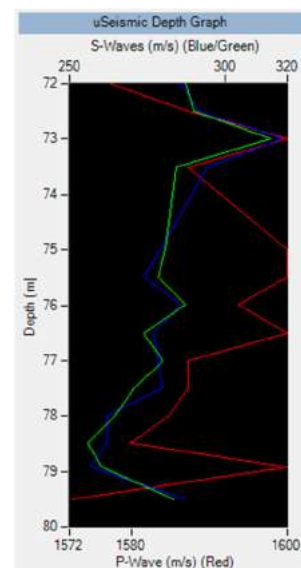
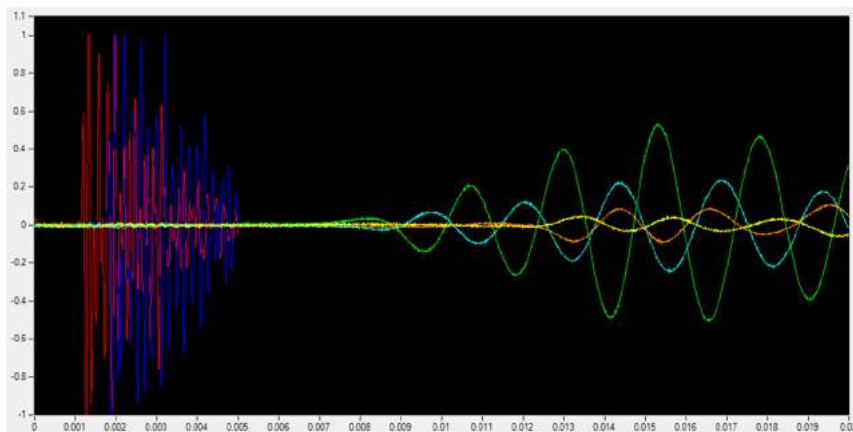
Compressional Arrival



Shear Arrival



Data processing



SINGLE PROBE RUN



PROBES

BOREHOLE IMAGING.

- Borehole Imaging: Acoustic Scanner
- Borehole Imaging: Optical Scanner

GEOPHYSICAL LOGGING PROBES

Acoustic Scanner

ASCN

MEASUREMENT PRINCIPLE

The acoustic scanner is an ultrasonic (high frequency) imaging probe which creates an orientated image of the borehole wall. The probe achieves the 360 degree image by using a rotating, angled mirror below a transducer. Image orientation is achieved using an internal 3 axis magnetometer and accelerometer. The transducer acts as a transmitter and receiver of the ultrasonic pulses. Image resolution is governed by the data transfer speed of the logging system and the rotation rate of the mirror below the transducer (known as motor step speed) which in turn controls the logging speed. Typical rotational sample rate available are 90, 120, 180 or 360 samples per revolution of the mirror.

The acoustic scanner creates two images:

Two Way Travel Time: Acoustic pulse travel time between probe, borehole wall and back. It is an ideal multi-fingered high resolution caliper.

Amplitude: Acoustic pulse intensity which related to the hardness of the rock, the smoothness of the borehole wall and the type of fluid in the borehole.

Ideally suited for:

Fracture identification, orientation and aperture measurement for geotechnical studies.
Structure characterisation for geological structural projects.
Slope stability studies.
Casing inspection.

Operations & Calibration:

Minimum borehole diameter of 50mm and a fluid is required in the borehole.
Probe is run with two centralisers. Best results are obtained if the probe is centralised.
Normally run in open borehole conditions. Can be run in casing for casing inspection surveys.

Highest data transmission speeds on the market meaning fastest logging speeds for highest vertical image resolution. Typically recorded in an uphole logging direction at logging speeds of 2 – 3 m/min for a minimum vertical image resolution of 3mm. (Downhole logging can be recorded for QA purposes).

Calibration from manufacturer for the 3 axis magnetometer and accelerometer. Marker position, probe rotation checks undertaken at regular intervals.

No stackability Optional gamma detector available.

SINGLE PROBE RUN

**PHYSICAL SPECIFICATIONS**

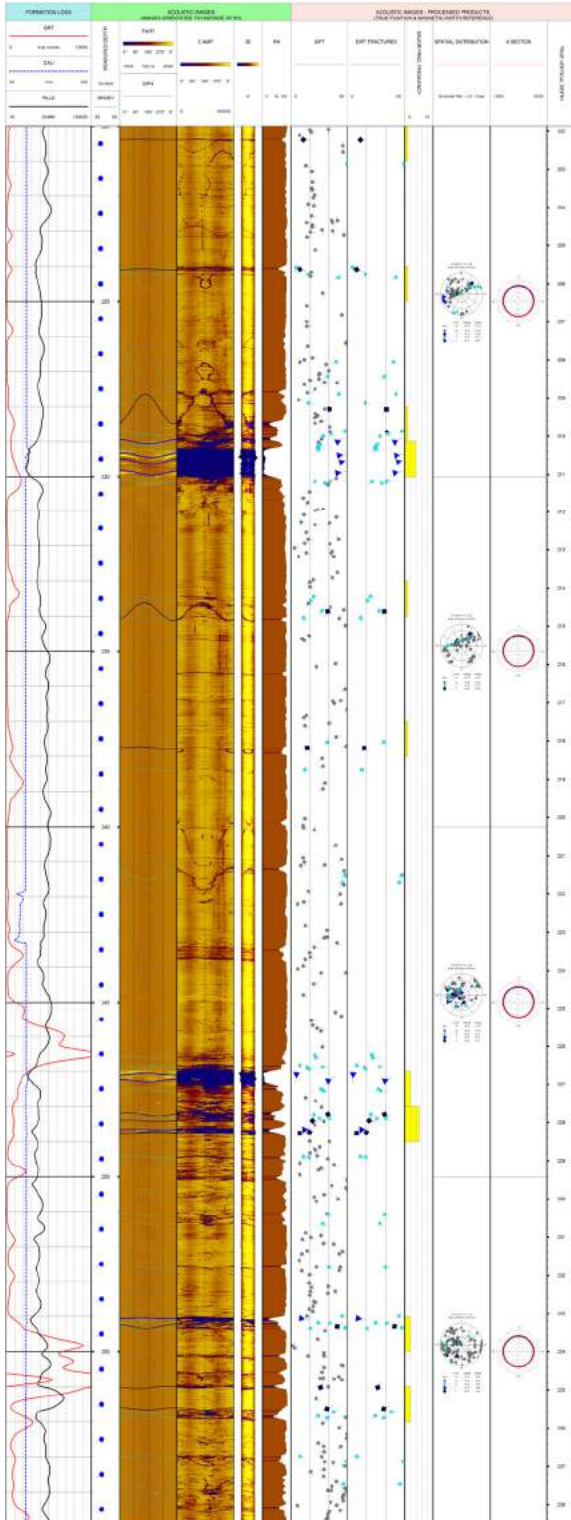
Weight	10.0kg
Length	2.07m
Diameter	42mm
BH diameter range	50—380mm
Radial resolution	90, 120, 180, 360 samples
Frequency	1.5 mHz
Transducer	Focused peizocomposite
Orientation	3 axis magnetometer & accelerometer
Maximum Temperature & pressure	80°C/20 MPa

GEOPHYSICAL LOGGING PROBES

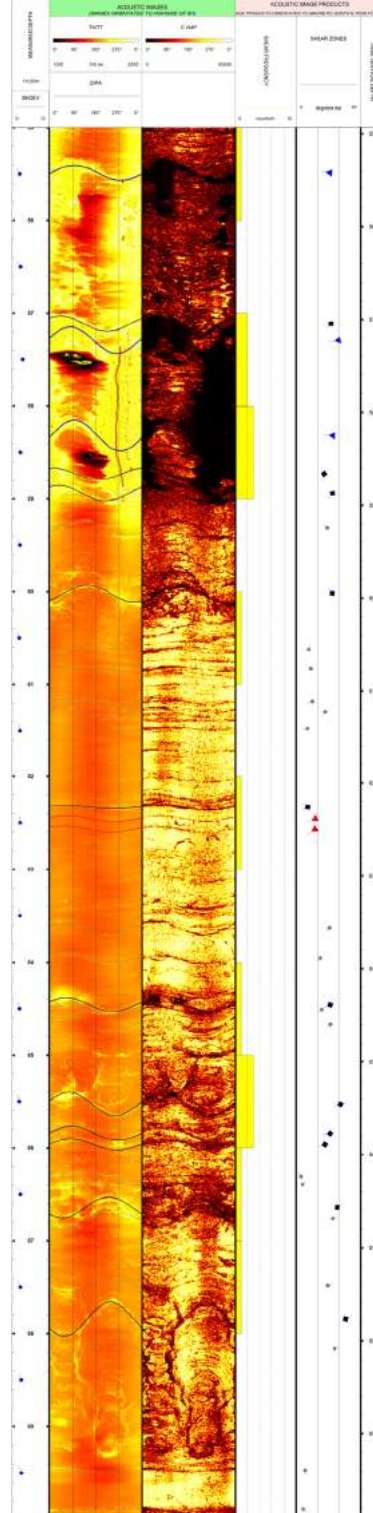
Acoustic Scanner

ASCN

CORED BOREHOLE IMAGE



RC BOREHOLE IMAGE



SINGLE PROBE





GEOPHYSICAL LOGGING PROBES

Optical
Scanner

OSCN

MEASUREMENT PRINCIPLE

The probe employs a combination of precision magnetometers and accelerometers to provide the probes position in the borehole and a high resolution ceramic mounted digital video camera sensor.

The digital video camera sensor can capture images at a rate of up to 60 frames per second and provides a full pixel by pixel colour calibration to ensure a perfect colour balance. The camera is focused through a prism which allows a 360 degree optical image of the borehole to be recorded.

The main operating condition is air or clear fluid filled borehole to allow the camera to see the wall of the borehole or casing.

Ideally suited for:

- Fracture identification, orientation and aperture measurement for geotechnical studies.
- Structure characterisation for geological structural projects.
- Slope stability studies.
- Casing inspection.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Requires air or clear fluid in the borehole and a clean borehole wall (no mud cake).
- Probe is run with two centralisers as best results are obtained when the probe is centralised.

Normally run in open borehole conditions. Can be run in casing for casing inspection surveys.

Highest data transmission speeds on the market meaning fastest logging speeds for highest vertical image resolution. Typically recorded in a downhole logging direction at logging speeds of 2 – 3 m/min for a minimum vertical image resolution of 1mm.

Calibration from manufacturer for the 3 axis magnetometer and accelerometer. Marker position and probe rotation checks are undertaken at regular intervals.

No stackability.

SINGLE PROBE RUN



PHYSICAL SPECIFICATIONS

Weight	10.0kg
Length	1.63m
Diameter	42mm
BH diameter range	50mm—viewable distance
Radial resolution	360 degree and up to 1440 pixels
Vertical resolution	< 1mm
Colour	True colour
Orientation	3 axis magnetometer & accelerometer
Maximum temperature & pressure	80°C/20 MPa



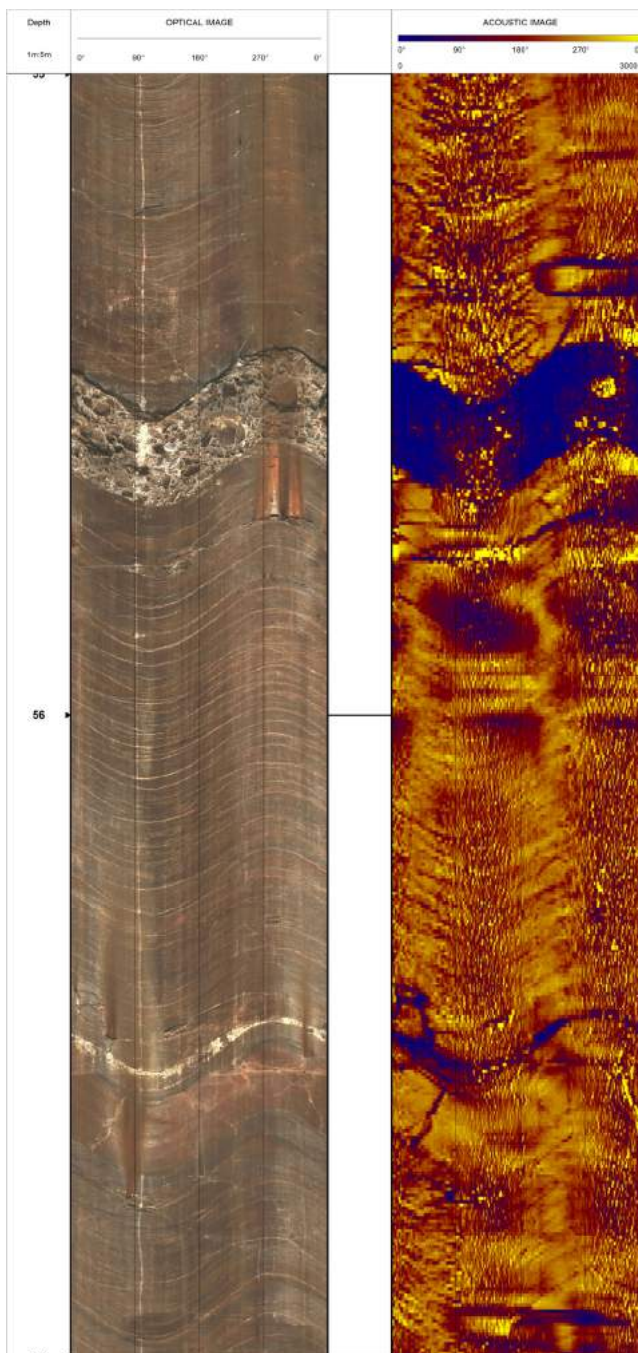
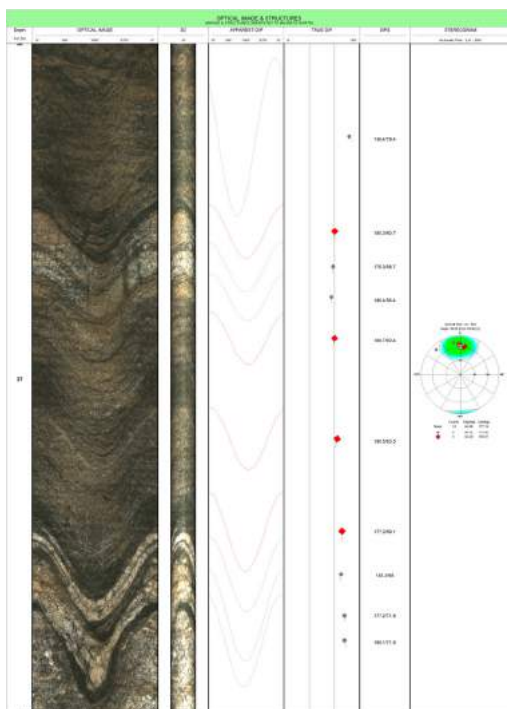
GEOPHYSICAL LOGGING PROBES

Optical Scanner

OSCN

OPTICAL IMAGES WITH STRUCTURES PICKED

COMPARISON OF OPTICAL & ACOUSTIC IMAGES



SINGLE PROBE RUN



PROBES

BOREHOLE DEVIATION.

- Borehole Deviation: Magnetic Deviation (includes Magnetic Vectors)
- Borehole Deviation: Gyroscopic Deviation
- Borehole Deviation: North Seeking Gyroscopic Deviation (Fibre Optic)



GEOPHYSICAL LOGGING PROBES

North Seeking Gyroscopic Deviation Logging (Fibre Optical Method)

FOG-GYRO

MEASUREMENT PRINCIPLE

The fibre optic gyro (FOG) uses Sagnac interferometry theory to measure the probe's current position relative to the earth's rotational axis. The detector is very sensitive to rotational movement and hence ideal for borehole deviation surveys. Each survey point measures components of the earth's rotation around the probe's X, Y and Z axis. The calculated 3D vector of the survey point will be parallel to the earth's rotation, thus pointing North. This information together with accelerometer data and current latitude is used to calculate the probe's position relative to True North

The gyro probe continuously transmits data to the surface logging unit during the survey which is monitored by the operator for integrity, tool face direction and probe rotation. ***This is not a memory gyro system.***

Ideally suited for:

- Borehole directional surveys within metal drill rods.
- Borehole directional surveys within metallic formation (iron ore, magnetite).

Operations & Calibration:

- Minimum borehole diameter of 40mm.
- Air and/or fluid filled borehole.
- Inside drill rods.

- No surface preparation required (sighting, spinning up)
- Typically recorded at multiple station intervals throughout the borehole.
- No drift corrections required.

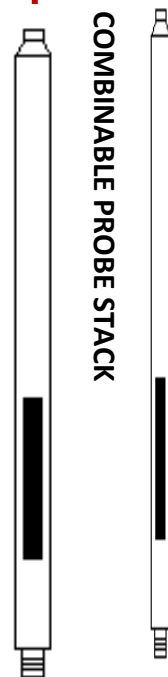
- Final curve units can be degrees north for the direction and degrees from vertical for inclination.
- Calibration is set by the manufacturer.

Probes can be stacked to the top of the probe. Typical combinations are:

- Gamma, inrod density.

SINGLE PROBE RUN

COMBINABLE PROBE STACK



PHYSICAL SPECIFICATIONS

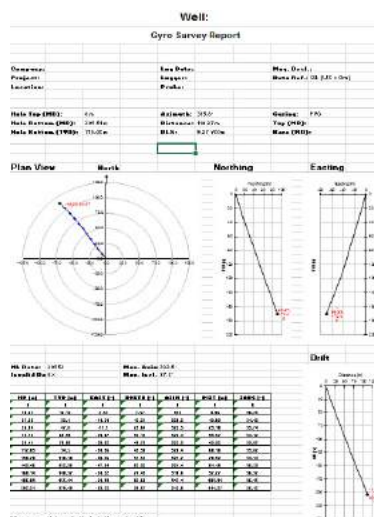
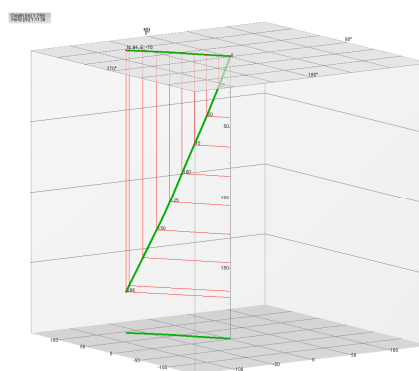
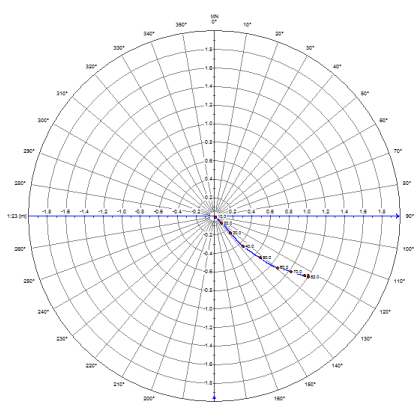
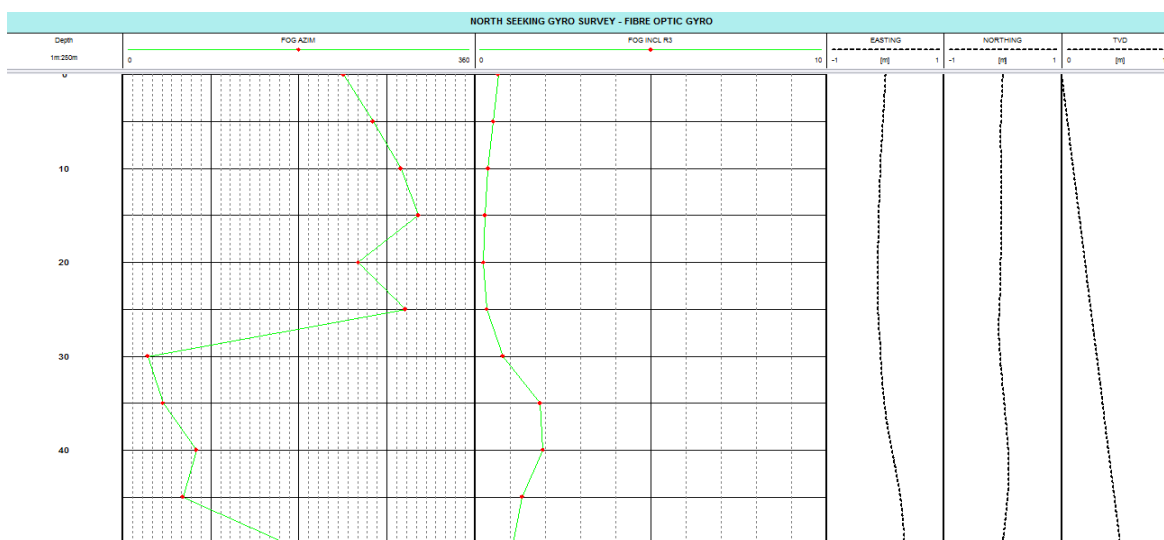
Weight	5.2kg
Length	1.99m
Diameter	34mm
Gyroscope	Fibre Optic Gyro System
Direction Accuracy	+/- 2.0°
Inclination Accuracy	+/- 0.4°
Maximum Pressure	20 MPa
Maximum Temperature	80°C



North Seeking Gyroscopic Deviation Logging (Fibre Optical Method)

FOG GYRO

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Gyroscopic Deviation

GYRO

MEASUREMENT PRINCIPLE

The probe employs a combination of the precision WellNav DG69 rate gyro unit and accelerometers to measure the probe's orientation to a sighted bearing at the surface (direction) and the earth's gravitational field (inclination). From the sighted surface bearing the probe's direction can be referenced to a known reference such as magnetic north, true north or a local grid north.

The gyro probe continuously transmits data to the surface logging unit during the survey which is monitored by the operator for integrity, tool face direction and probe rotation. ***This is not a memory gyro system.***

Ideally suited for:

- Borehole directional surveys within metal drill rods.
- Borehole directional surveys within metallic formation (iron ore, magnetite).

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole, cased borehole or inside drill rods.
- Cement bond logging.

Typically recorded in an uphole and downhole logging direction at logging speeds of 10 m/min or more.
Both logging runs are compared, pre-processing, for evidence of gyro drift.
Drift correction available.

Final curve units can be degrees north for the direction and degrees from vertical for inclination.
Calibration is set by the manufacturer.

Probes can be stacked to the bottom of the probe. Typical combinations are:

Gamma, magnetic deviation, impeller flowmeter.

PHYSICAL SPECIFICATIONS

Weight	10.0kg
Length	1.20m
Diameter	45mm
Gyroscope	WellNav DG69 Rate System
Direction Accuracy	+/- 2.0°
Inclination Accuracy	+/- 0.4°
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE RUN

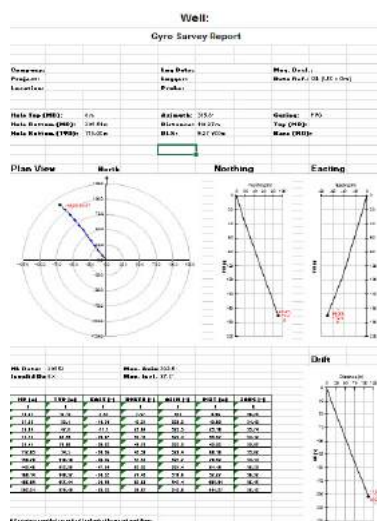
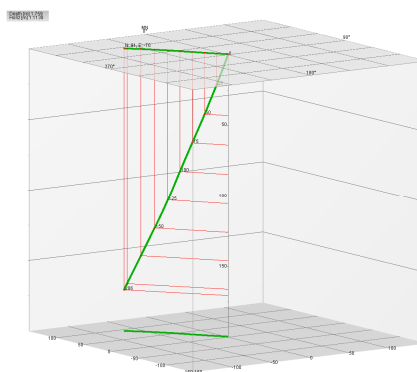
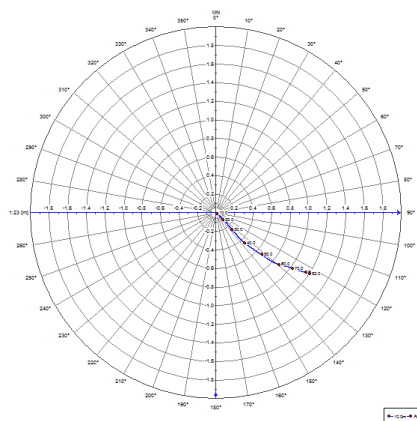
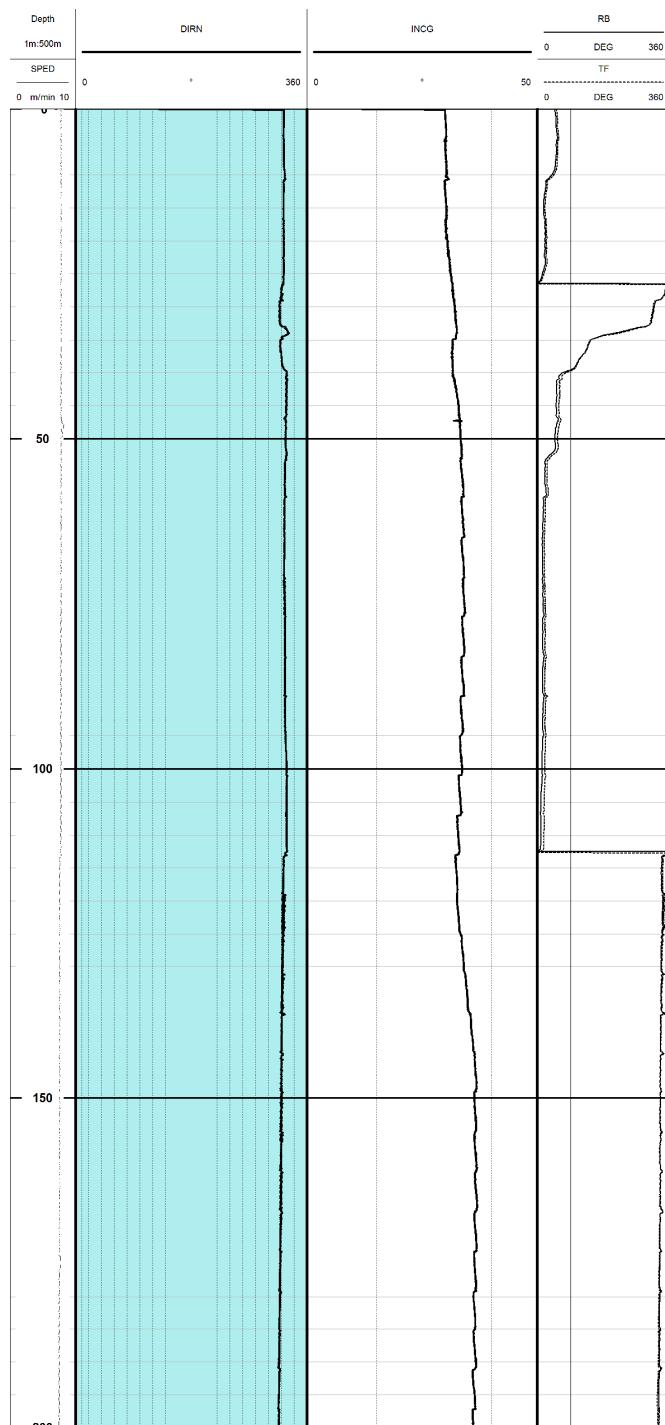
COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Gyroscopic Deviation

GYRO



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Magnetic Deviation

MDEV

MEASUREMENT PRINCIPLE

The probe employs a combination of 3 axes magnetometers and accelerometers (APS544 unit) and to measure the probe's orientation with respect to the earth's magnetic field (azimuth) and gravitational field (inclination).

The magnetic deviation probe continuously transmits data to the surface logging unit during the survey which is monitored by the operator for integrity, magnetic effects and probe rotation. The probe also measures the magnetic field strength which can be used as a quality indicator for the calculated magnetic azimuth

This is not a memory system.

The probe records the individual axial strengths of the 3 axes magnetometer and accelerometer thus allowing magnetic vectors to be calculated.

Ideally suited for:

- Borehole directional surveys within non-magnetic ground.
- Magnetic field strength surveys for iron ore exploration and mining.
- Offhole magnetic surveys.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or PVC cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 5 - 7 m/min.
(Downhole logging can be recorded for QA purposes).

Final curve units can be degrees magnetic north for the direction and degrees from vertical for inclination.

Calibration is set by the manufacturer.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

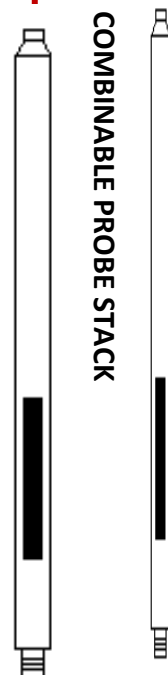
Gamma, dual laterolog, dual induction, fullwave sonic, formation density.

PHYSICAL SPECIFICATIONS

Weight	5.0kg
Length	0.70m
Diameter	38mm
Sensor Package	Applied Physics 544
Direction Accuracy	+/- 2.0°
Inclination Accuracy	+/- 0.4°
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE RUN

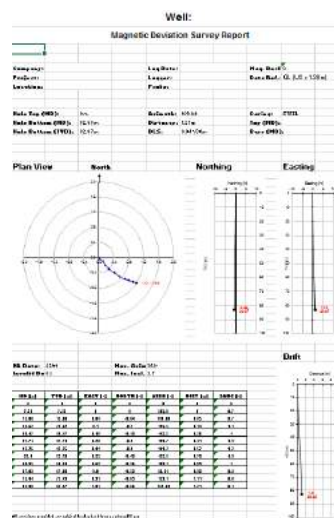
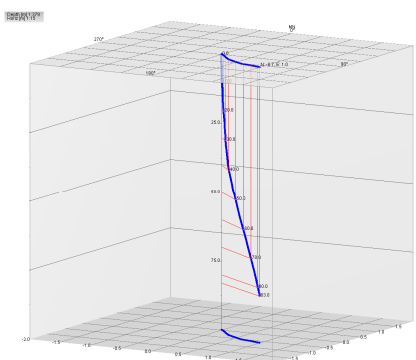
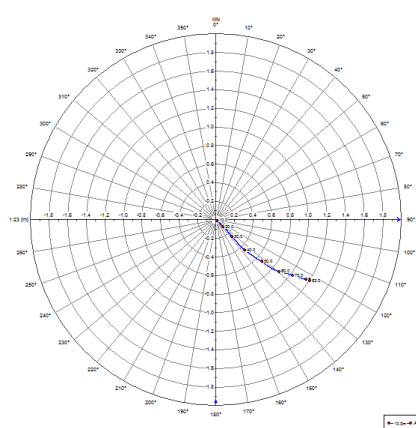
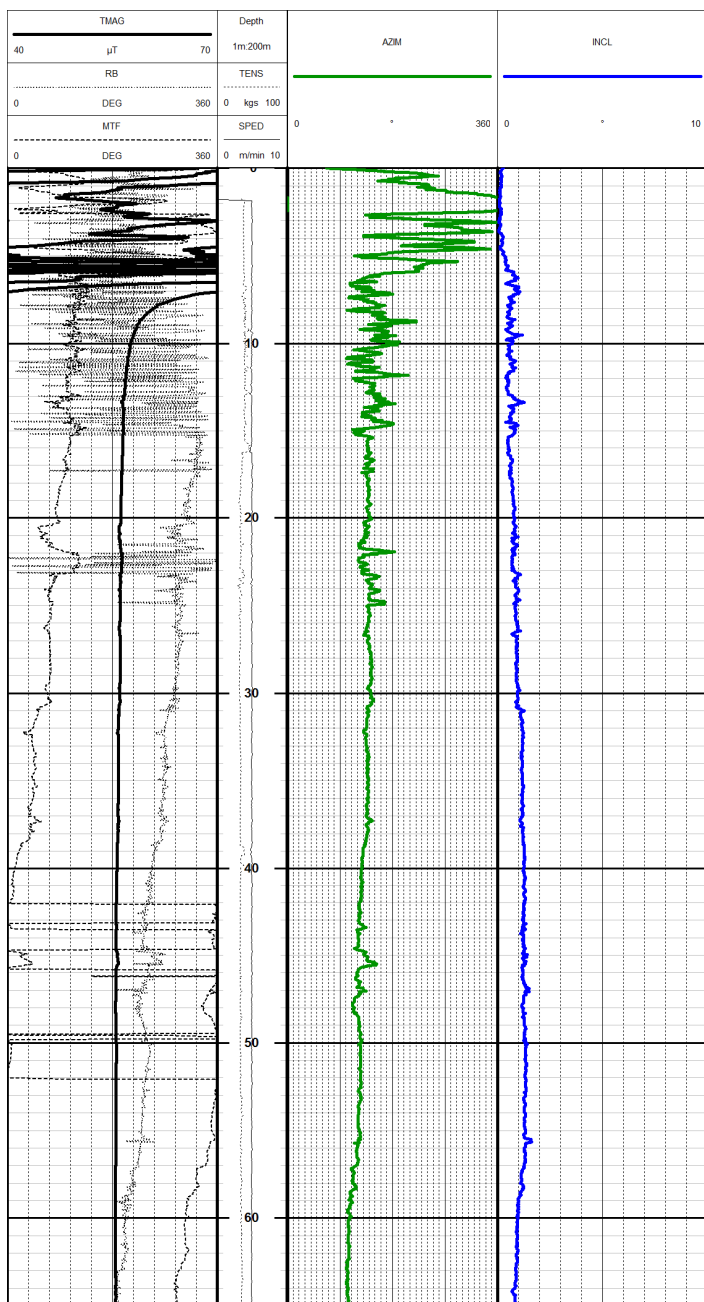
COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

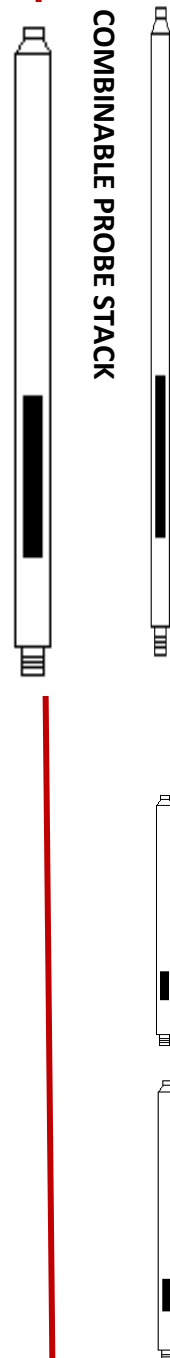
Magnetic Deviation

MDEV



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Magnetic Vectors

VECS

MEASUREMENT PRINCIPLE

The probe employs a combination of 3 axes magnetometers and accelerometers (APS544 unit) and to measure the probe's orientation with respect to the earth's magnetic field (azimuth) and gravitational field (inclination).

Magnetic vectors are taken from the onboard three axis magnetometer of the magnetic deviation probe which continuously transmits data to the surface logging unit during the survey. The probe also measures the magnetic field strength which can be used as a quality indicator for the calculated magnetic azimuth.

This is not a memory system.

Ideally suited for:

- Borehole directional surveys within non-magnetic ground.
- Magnetic field strength surveys for iron ore exploration and mining.
- Offhole magnetic surveys.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or PVC cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 5 - 7 m/min.
(Downhole logging can be recorded for QA purposes).

Final curve units can be degrees magnetic north for the direction and degrees from vertical for inclination.

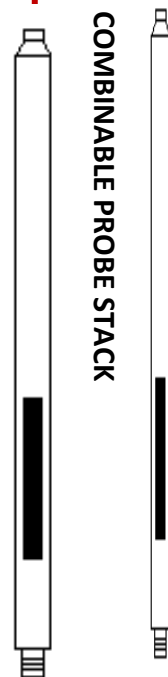
Calibration is set by the manufacturer.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

Gamma, dual laterolog, dual induction, fullwave sonic, formation density.

SINGLE PROBE RUN

COMBINABLE PROBE STACK



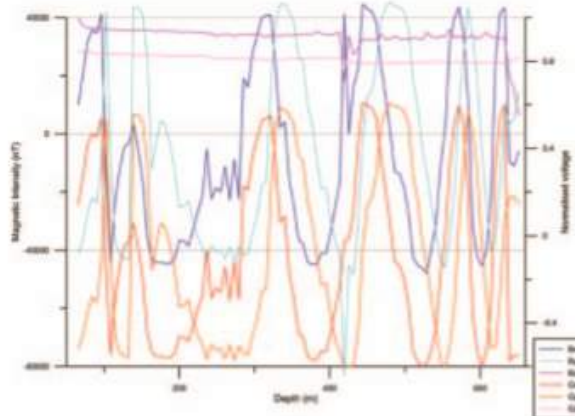
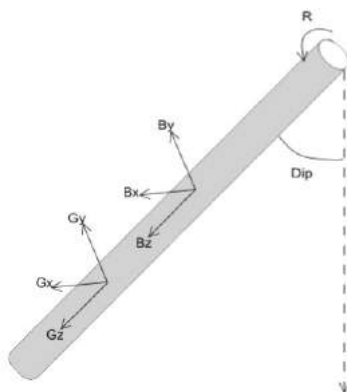
PHYSICAL SPECIFICATIONS

Weight	5.0kg
Length	0.70m
Diameter	38mm
Sensor Package	Applied Physics 544
Direction Accuracy	+/- 2.0°
Inclination Accuracy	+/- 0.4°
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

Magnetic Vectors

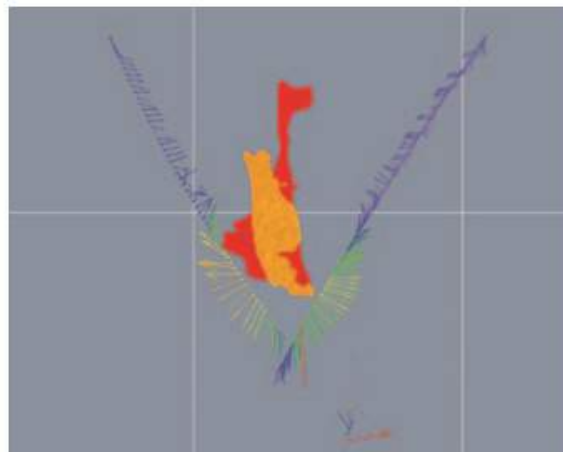
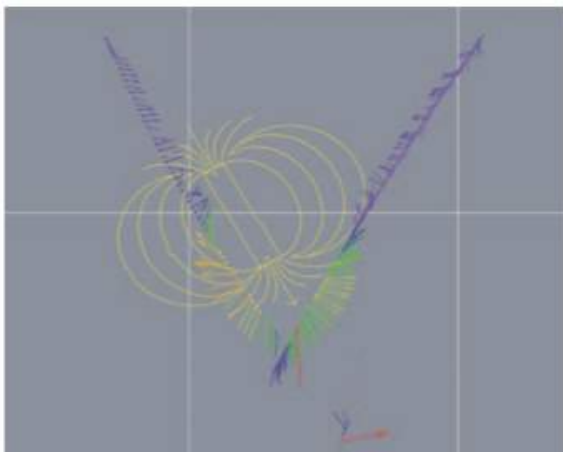
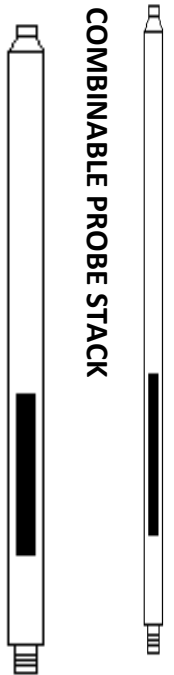
VECS



Internal Magnetometer orientation and Example of Raw Magnetometer Data

SINGLE PROBE RUN

COMBINABLE PROBE STACK



Magnetic vector data used for offhole Magnetic Modelling

PROBES

GROUNDWATER: WATER QUALITY, FLOW & SAMPLING.

- Water Quality: Fluid Temperature or Fluid Temperature & Conductivity
- Flowmeters: Impeller & Heatpulse Flowmeters
- Fluid Sampler:
- Water level:

GEOPHYSICAL LOGGING PROBES

Fluid Temperature

Fluid Conductivity

TCME

MEASUREMENT PRINCIPLE

The probe measures the temperature and conductivity of the fluid in the borehole. The fluid temperature and conductivity detectors are mounted in an open chamber at the base of the probe, thus allowing free fluid flow through the detectors during downhole logging.

Fluid conductivity is measured by a multi-electrode array which compensates for changes in electrode contact resistivity.

Fluid temperature is measured using a high precision platinum resistance thermistor. The thermistor has a rapid response time to minimise the effects of logging speed.

Ideally suited for:

Groundwater investigations.

Operations & Calibration:

Minimum borehole diameter of 50mm.

Fluid filled open borehole conditions.

Typically recorded in a downhole logging direction at logging speeds of 5 – 7 m/min.

Downhole logging is preferred to obtain as fresh a sample as possible.

Final curve units can be degrees Celsius and micro-siemens per centimetre

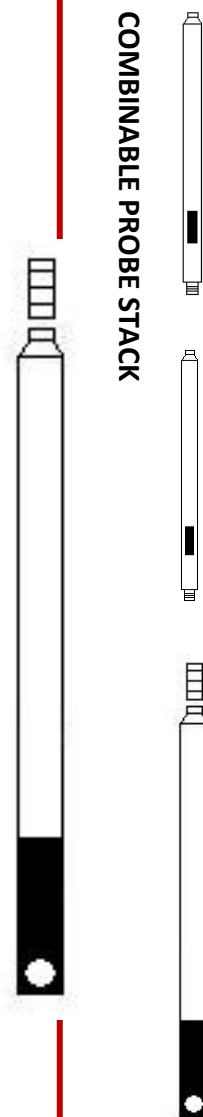
Calibration from manufacturer or a series of laboratory solutions.

Probes can be stacked to the top of the probe. Typical combinations are:

Gamma, gamma and caliper, magnetic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

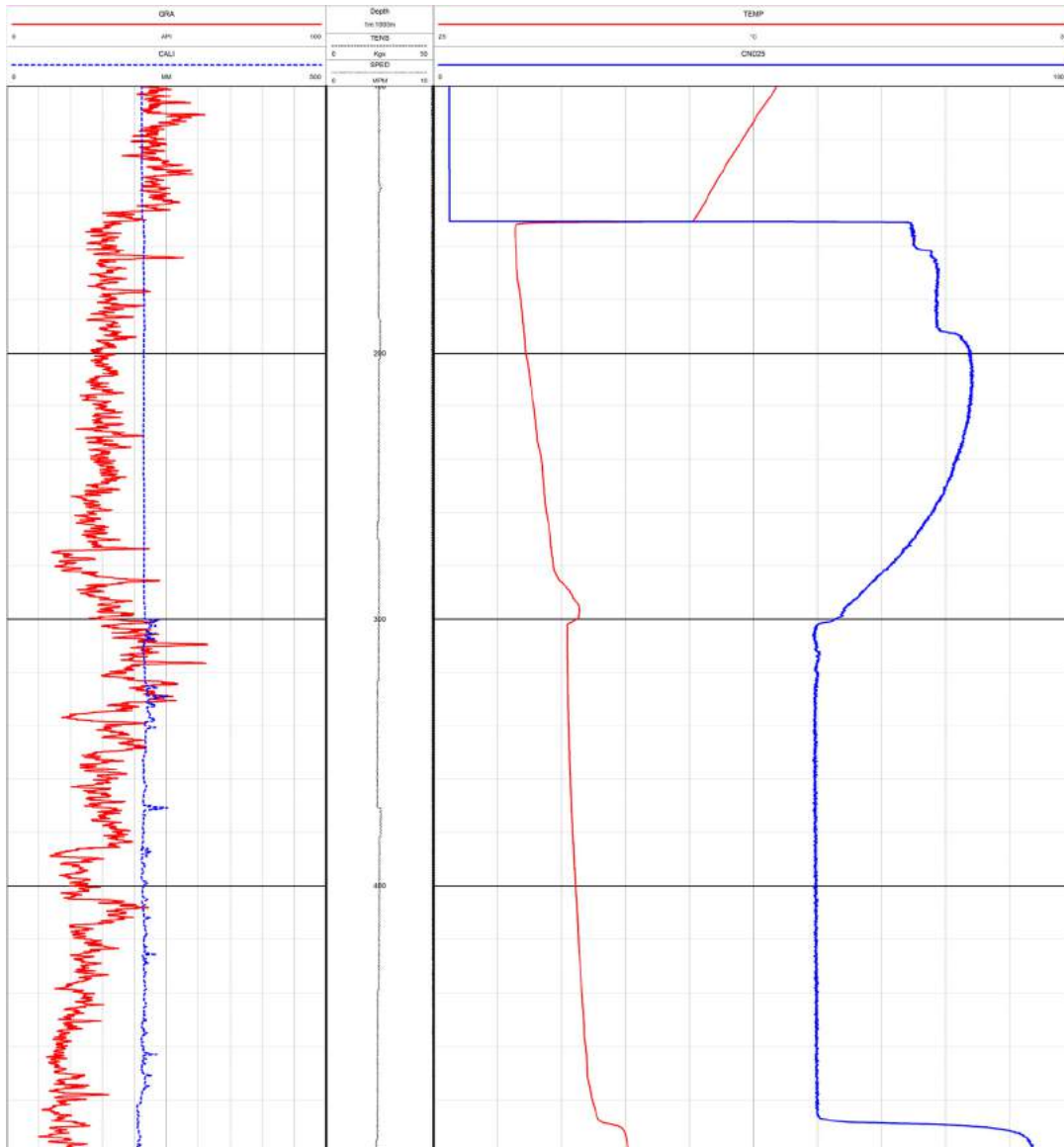
**PHYSICAL SPECIFICATIONS**

	TEMP	COND
Weight	2.6kg	
Length	0.70m	
Diameter	38mm	
Detector	PT100 (platinum thermistor)	Multiple electrodes
Range	0—80°C	0—50000 µS/cm
Accuracy & Resolution	+/- 0.3°C & 0.01°C	1% at 1000 µS/cm
Maximum Pressure	20 MPa	
Maximum Temperature	80°C	

GEOPHYSICAL LOGGING PROBES

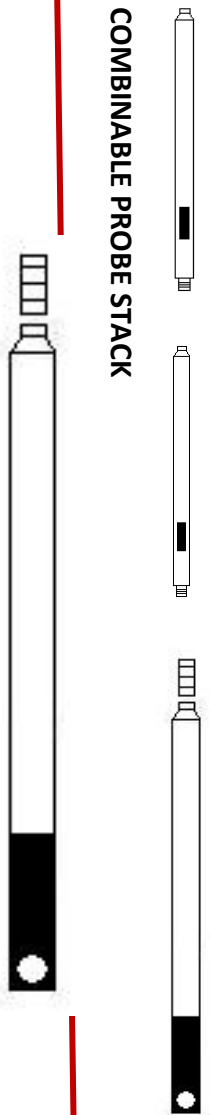
Fluid Temperature Fluid Conductivity

TCME



SINGLE PROBE

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Fluid Temperature

TEMP

MEASUREMENT PRINCIPLE

The probe is used for precise temperature measurements of the fluid in the borehole.

Fluid temperature is measured using a high precision platinum resistance thermistor. The thermistor has a rapid response time to minimise the effects of logging speed. The thermistor is mounted in an open chamber to allow free flow of fluid during data acquisition.

Suppliers of the platinum resistance thermometry conform to IEC751:1983 standard.

Ideally suited for:

Groundwater investigations.
Geothermal exploration and production.

Operations & Calibration:

Minimum borehole diameter of 50mm.
Fluid filled open borehole conditions.

Typically recorded in a downhole logging direction at logging speeds of 5 – 7 m/min.
Downhole logging is preferred to obtain a fresh a sample as possible.

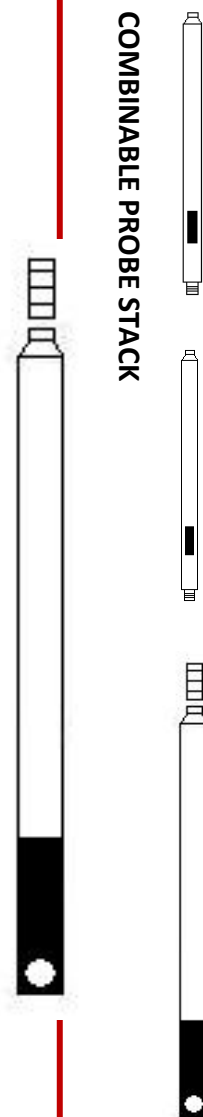
Final curve units can be degrees Celsius.

Calibration from manufacturer.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:
Gamma, gamma and caliper, magnetic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

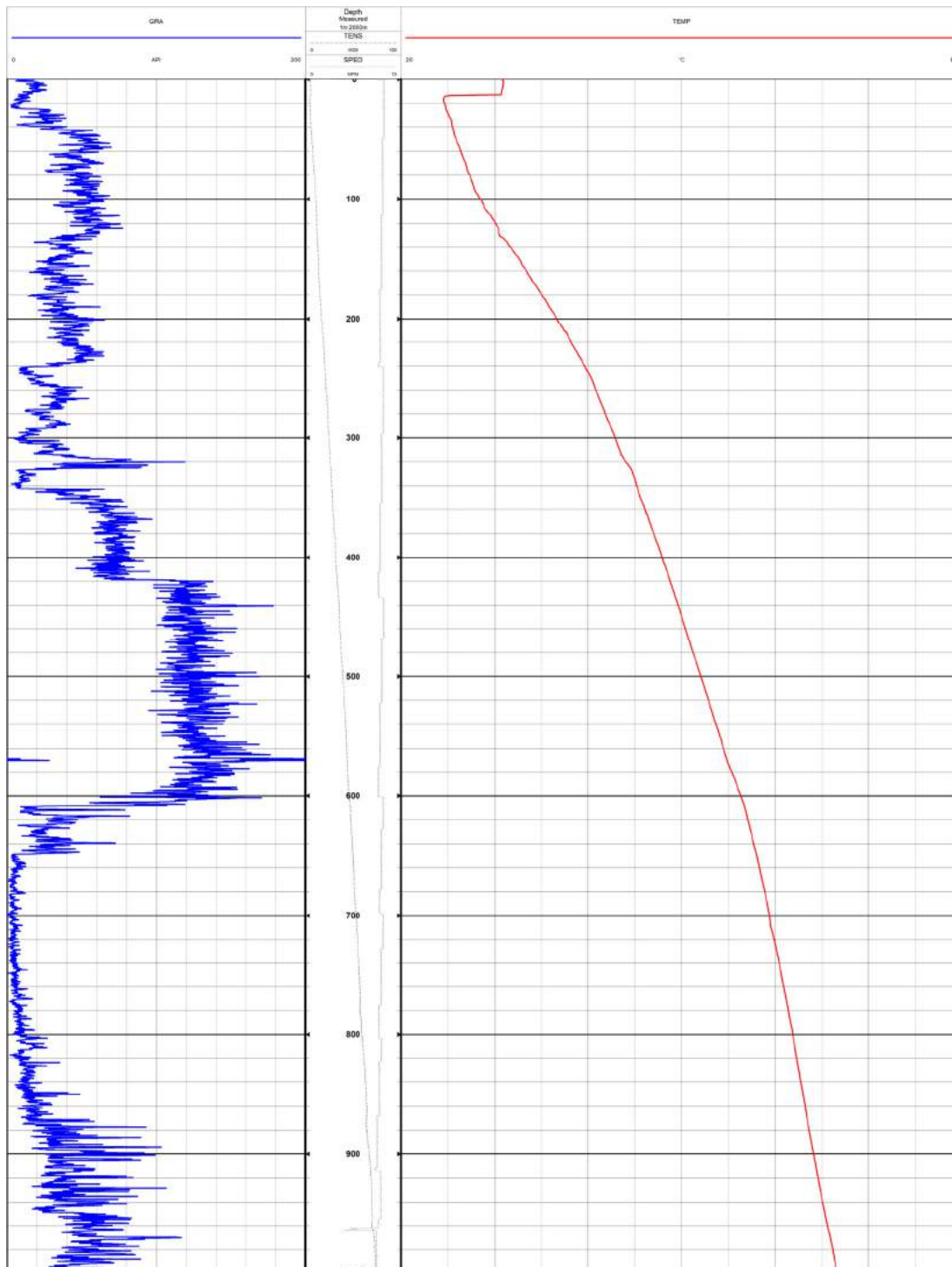
**PHYSICAL SPECIFICATIONS**

Weight	2.6kg
Length	0.53m
Diameter	38mm
Detector	PT100 (platinum thermistor)
Range	0—80°C
Accuracy & Resolution	+/- 0.3°C & 0.01°C
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

Fluid
Temperature

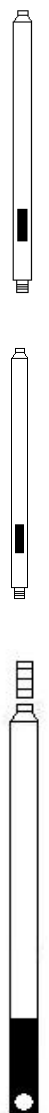
TEMP



SINGLE PROBE



COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Impeller Flowmeter

IFLW

MEASUREMENT PRINCIPLE

Impeller flowmeter probes are employed to measure inter borehole flows and/or inflows/outflows of groundwater within the borehole. The impeller flowmeter measures a higher rate of groundwater flow in the borehole with different cage sizes available for various borehole diameters.

As well as rotational speed of the impeller being measured, the direction of impeller rotation is also measured which aids the interpretation of uphole or downhole flow in the borehole.

Impeller flowmeters can be combined with fluid temperature and conductivity probes to provide a powerful analytical tool during pumping tests.

Ideally suited for:

Groundwater monitoring and characterisation.

Operations & Calibration:

Minimum borehole diameter of 60mm.

Requires fluid in the borehole.

Can be run in open borehole or cased borehole conditions.

Typically run in both uphole and downhole logging directions at speeds between 10 and 15 m/min.

Final curve units can be counts per second, metres per minute or litres per second.

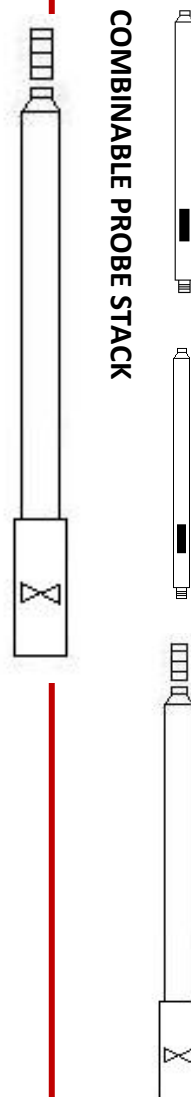
Calibration via uphole/downhole runs over a zone of known constant borehole diameter.

Probes can be stacked to the top of the probe. Typical combinations are:

Gamma, gamma & magnetic deviation, gyroscopic deviation.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

**PHYSICAL SPECIFICATIONS**

Weight	3.5kg
Length	0.48m
Diameter	50mm, 75mm, 100mm
Impeller Cage Sizes	50mm, 75mm, 100mm
Maximum Pressure	20 MPa
Maximum Temperature	80°C



GEOPHYSICAL LOGGING PROBES

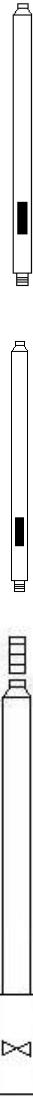
Impeller
Flowmeter

IFLW



SINGLE PROBE RUN

COMBINABLE PROBE STACK





GEOPHYSICAL LOGGING PROBES

Heatpulse Flowmeter

HPFM

MEASUREMENT PRINCIPLE

The heatpulse flowmeter measures low to very low flow rates in the borehole by generating an electronic pulse of heat (capacitor) in the measurement chamber which can be detected above and below through highly sensitive thermistors.

The heatpulse flowmeter involves stationary measurements throughout the interval of interest and is used when expected groundwater flows are below the detectable limit of an impeller flowmeter.

Ideally suited for:

Groundwater monitoring and characterisation.

Operations & Calibration:

Minimum borehole diameter of 60mm.

Requires fluid in the borehole.

Can be run in open borehole or cased borehole conditions.

Stationary measurements over interval of interest

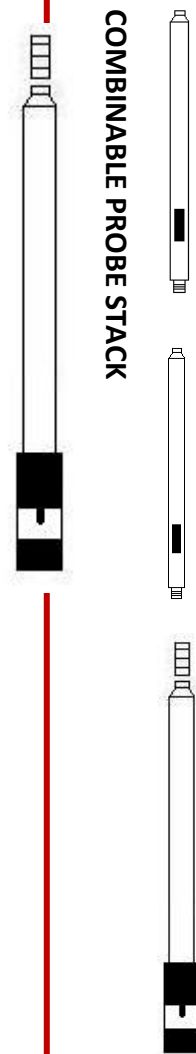
Calibration via workshop test flow tube.

Probes can be stacked to the top of the probe. Typical combinations are:

Gamma, gamma & magnetic deviation.

SINGLE PROBE RUN

COMBINABLE PROBE STACK



PHYSICAL SPECIFICATIONS

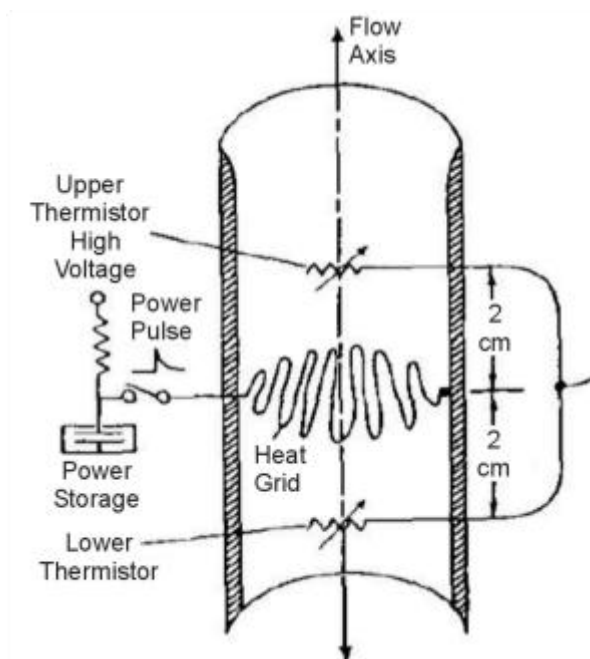
Weight	6.2kg
Length	0.90m
Diameter	51mm
Maximum Pressure	20 MPa
Maximum Temperature	80°C



GEOPHYSICAL LOGGING PROBES

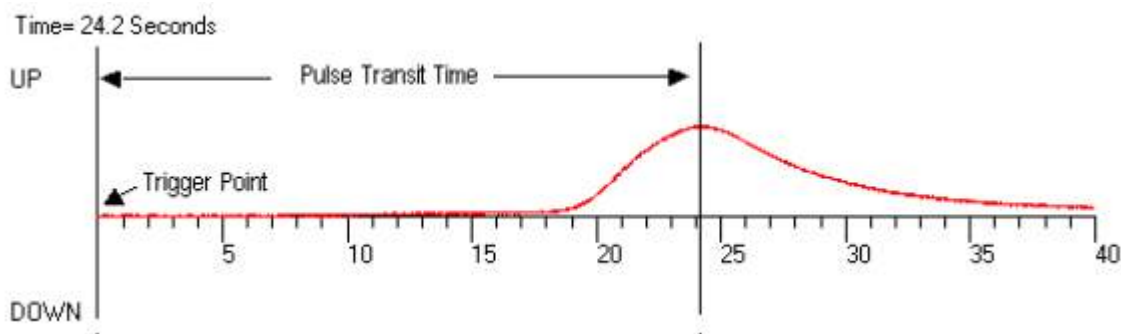
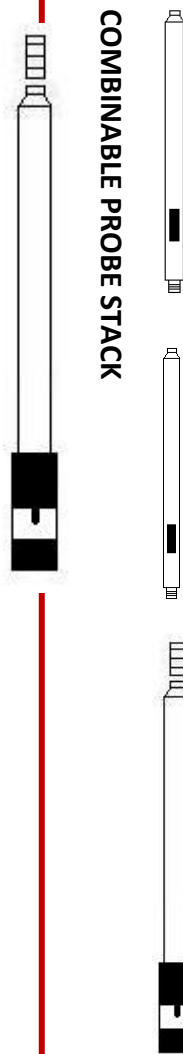
Heatpulse Flowmeter

HPFM



SINGLE PROBE RUN

COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Fluid Sampler

ASMP

MEASUREMENT PRINCIPLE

The fluid sampler probe is addressable from commands from the surface such that it can be set at any depth in the borehole and a sample taken. The fluid sampler has a one litre capacity. Three filtered inlets are used to avoid debris in the sample.

The sample retrieval at the surface is done under controlled risk assessed conditions to avoid loss of the sample and ensure a safe process. Probes can be “stacked” on top of the fluid sampler for multi parameter logging.

Ideally suited for:

- Groundwater sampling.
- Environmental contamination.
- Pollution studies.

Operations & Calibration:

- Minimum borehole diameter is 60mm.
- Requires fluid in the borehole.

The sample can then be processed as per the clients requirements.

Probes can be stacked to the top of the probe. Typical combinations are:

Gamma, gamma & magnetic deviation.

SINGLE PROBE RUN

COMBINABLE PROBE STACK

PHYSICAL SPECIFICATIONS

Weight	10.0kg
Length	1.8m
Diameter	42mm
Capacity	1 litre
Maximum Temperature	80°C
Maximum Pressure	20MPa

GEOPHYSICAL LOGGING PROBES

Fluid Sampler

ASMP

SINGLE PROBE RUN

COMBINABLE PROBE STACK

Bacterial Analysis				
Analysis	Method	Unit	MDL	RL
E. Coli	Colitag	Present/Absent		
E. Coli	SM 9223B	MPN/100 ml	1.0	1.0
Fecal Coliforms	SM 9222D	CFU/100 ml	1.0	1.0
Fecal Coliforms	SM 9222D	CFU/ml	1.0	1.0
Total Coliforms	Colitag	Present/Absent		
Total Coliforms	SM 9223B	Present/Absent		
Total Coliforms	SM 9223B	MPN/100 ml	1.0	1.0

Drinking Water				
Analysis	Method	Unit	MDL	RL
Alkalinity as CaCO ₃	SM 2320B	mg/l	1.0	5.0
Bicarbonate	SM 2320B	mg/l	1.0	5.0
Carbonate	SM 2320B	mg/l	1.0	5.0
Chloride	EPA 300.0	mg/l	0.04	0.2
Color	SM 2120B	Color Units	5.0	5.0
Fluoride	EPA 300.0	mg/l	0.02	0.2
Hardness	SM 2340C	mg/l	3.0	5.0
Hydroxide	SM 2320B	mg/l	1.0	5.0
Nitrate as N	EPA 353.2	mg/l	0.01	0.05
Nitrite as N	EPA 353.2	mg/l	0.01	0.03
Perchlorate	EPA 331.0	ug/l	0.15	0.5
pH	SM 4500H+B	pH Units	0.01	0.01
Specific Conductance	SM 2510B	umhos/cm	2.0	10.0
Sulfate as SO ₄	EPA 300.0	mg/l	0.05	0.4
Total Dissolved Solids	SM 2540C	mg/l	3.0	6.0
Turbidity	SM 2130B	NTU	0.1	0.5
Hardness	SM 2340C	mg/l	3.0	5.0

Waste Water				
BOD - 5 Day	SM 5210	mg/l	3.0	3.0
Oil & Grease	EPA 1664A	mg/l	1.4	5.0
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	mg/l	0.1	0.2
Total Suspended Solids	SM 2540D	mg/l	2.0	6.0
BOD - 5 Day	SM 5210	mg/l	3.0	3.0
Total Suspended Solids	SM 2540D	mg/l	2.0	6.0

Stormwater (NPDES/AZPEDES)				
Alkalinity as CaCO ₃	SM 2320B	mg/l	1.0	5.0
Chloride	EPA 300.0	mg/l	0.04	0.2
pH	SM 4500H+B	pH Units	0.01	0.01
Settleable Solids	SM 2540F	ml/l/hr	0.1	0.1
Total Suspended Solids	SM 2540D	mg/l	2.0	6.0
Total Suspended Solids	SM 2540D	mg/l	2.0	6.0
Turbidity	SM 2130B	NTU	0.1	0.5

GEOPHYSICAL LOGGING PROBES

Water Level

WLIS

MEASUREMENT PRINCIPLE

The water level probe is a simple probe to accurately measure the fluid level in the borehole. Water level is an often neglected measurement but it is important in controlling borehole corrections for other probes. There are numerous advantages to having a digital log of fluid level.

The electrode is mounted in an open chamber at the base of the probe thus allowing free flow of the fluid through the detectors during data acquisition.

Ideally suited for:

- Groundwater investigations.
- Borehole environmental corrections.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Fluid filled open borehole conditions.

Typically recorded in a downhole logging direction at logging speeds of 5 – 7 m/min.

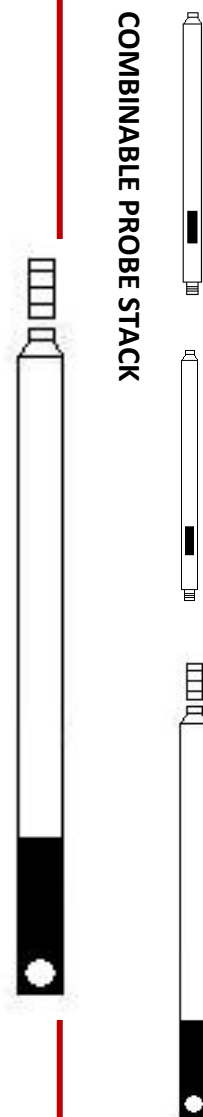
Final curve unit is unitless.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

Gamma, gamma and caliper, magnetic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

**PHYSICAL SPECIFICATIONS**

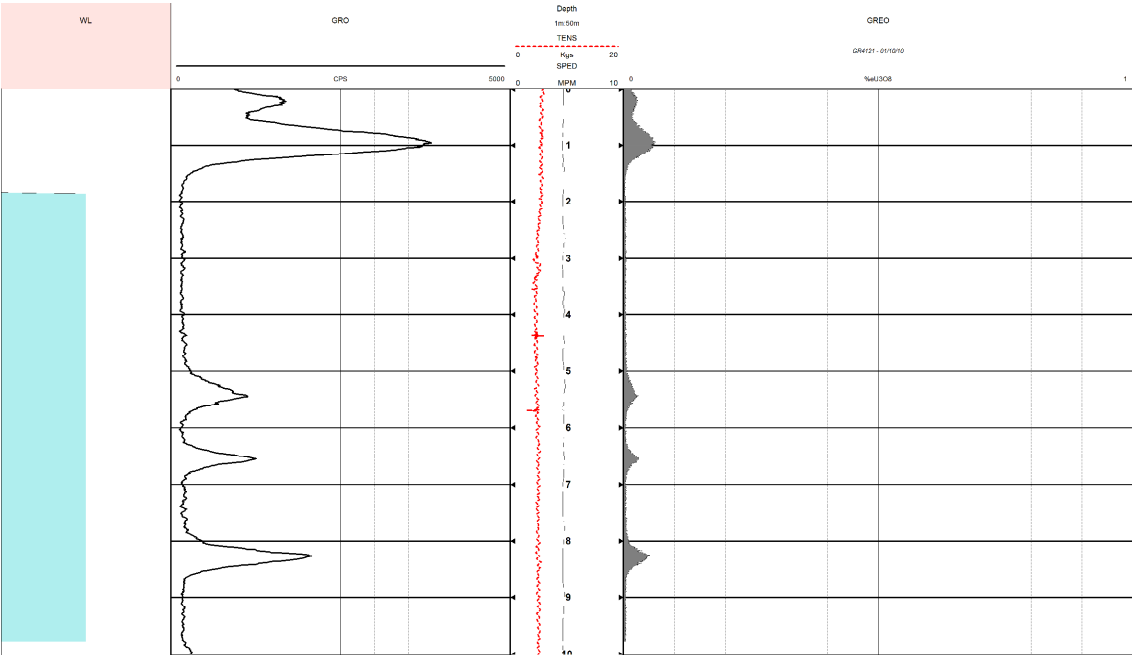
Weight	2.6kg
Length	0.53m
Diameter	38mm
Detector	Electrode
Accuracy	+/- 5cm
Maximum Pressure	20 MPa
Maximum Temperature	80°C



GEOPHYSICAL LOGGING PROBES

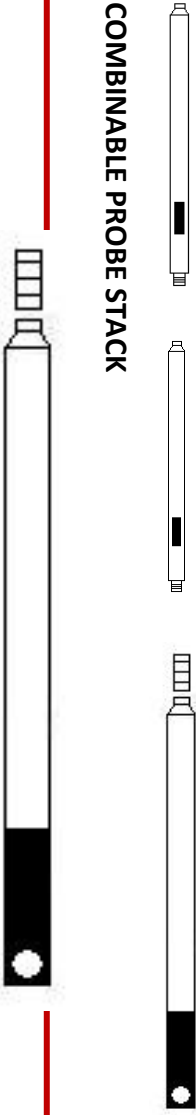
Water
Level

WLIS



SINGLE PROBE

COMBINABLE PROBE STACK



PROBES

URANIUM EXPLORATION & PRODUCTION.

- Gamma: Total Gamma
- Gamma: Spectral Gamma (K, U, TH)
- Gamma: Filtered
- Gamma: Geiger Muller

GEOPHYSICAL LOGGING PROBES

Total Gamma

NGRS

MEASUREMENT PRINCIPLE

The total gamma probe measures naturally occurring radioactivity. The most common naturally occurring radioactivity is associated with K^{40} , Th^{232} and $U^{232-238}$ which are associated with certain rocks (eg clays/shales) making the gamma curves an excellent lithological identifier tool. A scintillation detector system consisting of a sodium iodide crystal and a photomultiplier tube to measure gamma radiation.

Ideally suited for:

- Uranium exploration and mining.
- Uranium grade determination.
- Coal and iron ore exploration
- Sedimentary studies.
- Logging run depth matching.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.

(Downhole logging can be recorded for QA purposes)

Calibration via Adelaide Models – AM1, AM2, AM3 for Uranium grade and AM6 for API calibration.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

Gamma, filtered gamma, magnetic deviation, caliper, fluid temperature/conductivity dual laterolog, dual induction, formation density, fullwave sonic, gyroscopic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

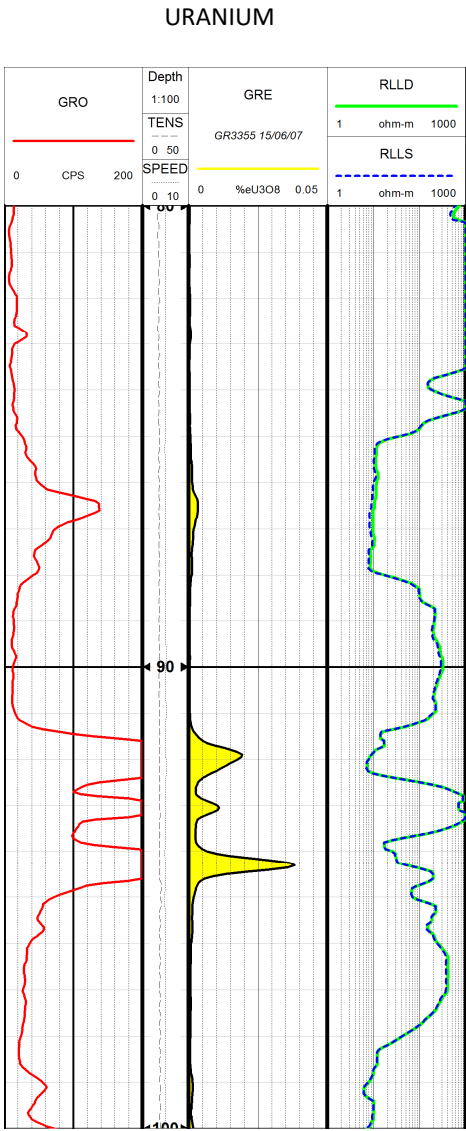
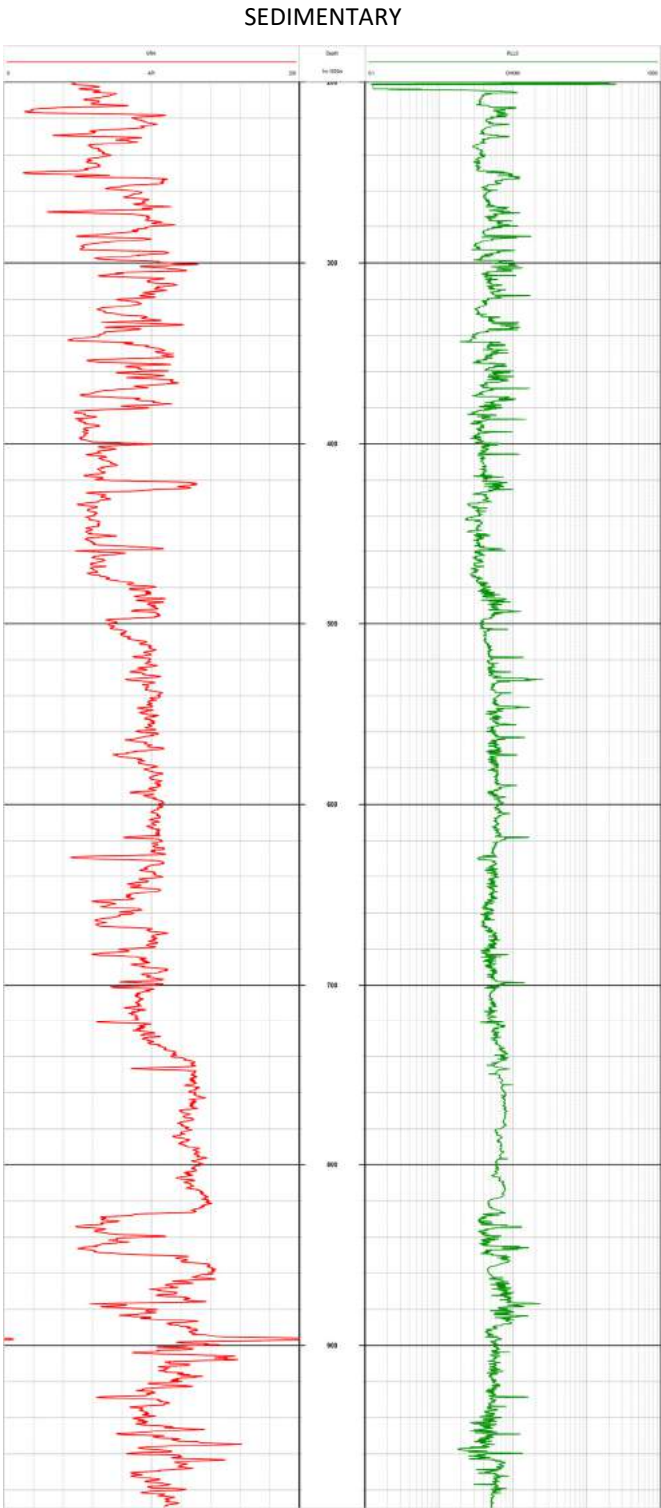
PHYSICAL SPECIFICATIONS

Weight	5.0kg
Length	0.63m
Diameter	38mm
Crystal size	25mm x 50mm
Maximum Pressure	20 MPa
Maximum Temperature	80°C

GEOPHYSICAL LOGGING PROBES

Total
Gamma

NGRS



SINGLE PROBE



COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

Spectral Gamma

SGAM

MEASUREMENT PRINCIPLE

Spectral gamma probes measure naturally occurring radioactivity. The most common naturally occurring radioactivity is associated with K^{40} , TH^{232} and $U^{232-238}$ which are associated with certain rocks (eg clays/shales) making the gamma curves an excellent lithological identifier tool. The spectral gamma probes use a scintillation system consisting of a sodium iodide crystal and a photomultiplier tube to measure gamma radiation. The Sodium Iodide crystal in the spectral gamma probe is large to measure low count rates.

The spectral gamma probe is able to measure gamma radiation with specific energy windows. The target energy windows are for K^{40} , TH^{232} and $U^{232-238}$ so that specific curves are generated for each isotope. The scintillation system is temperature compensated to avoid measurement drift. A small Cs^{137} source is used for spectral gamma energy window quality assurance at each borehole.

Ideally suited for:

Uranium exploration and mining.
Sedimentary studies.

Operations & Calibration:

Minimum borehole diameter of 75mm.
Air and/or fluid filled borehole.
Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 1.5 m/min.

Final curve units can be counts per second, uranium grade in %eU₃O₈ or ppm_eU₃O₈, percentage K, U and TH

Calibration via Adelaide Models – AM6.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:

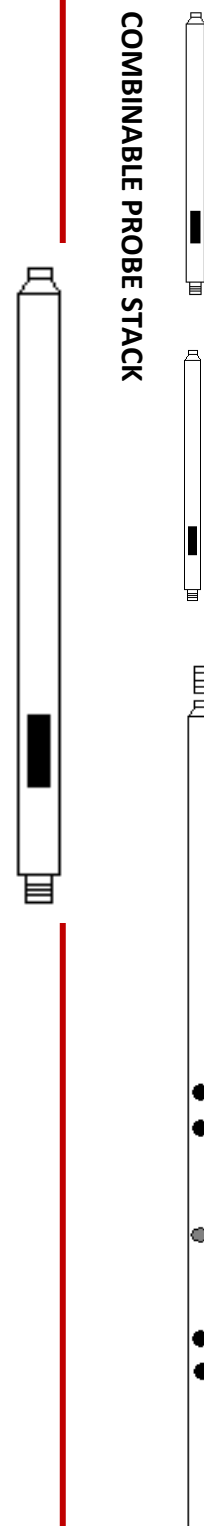
Gamma, filtered gamma, magnetic deviation, caliper, fluid temperature and conductivity.

PHYSICAL SPECIFICATIONS

Weight	7.0kg
Length	0.90m
Diameter	60mm
Crystal size	50mm x 150mm
Maximum Pressure	20 MPa
Maximum Temperature	80°C

SINGLE PROBE

COMBINABLE PROBE STACK

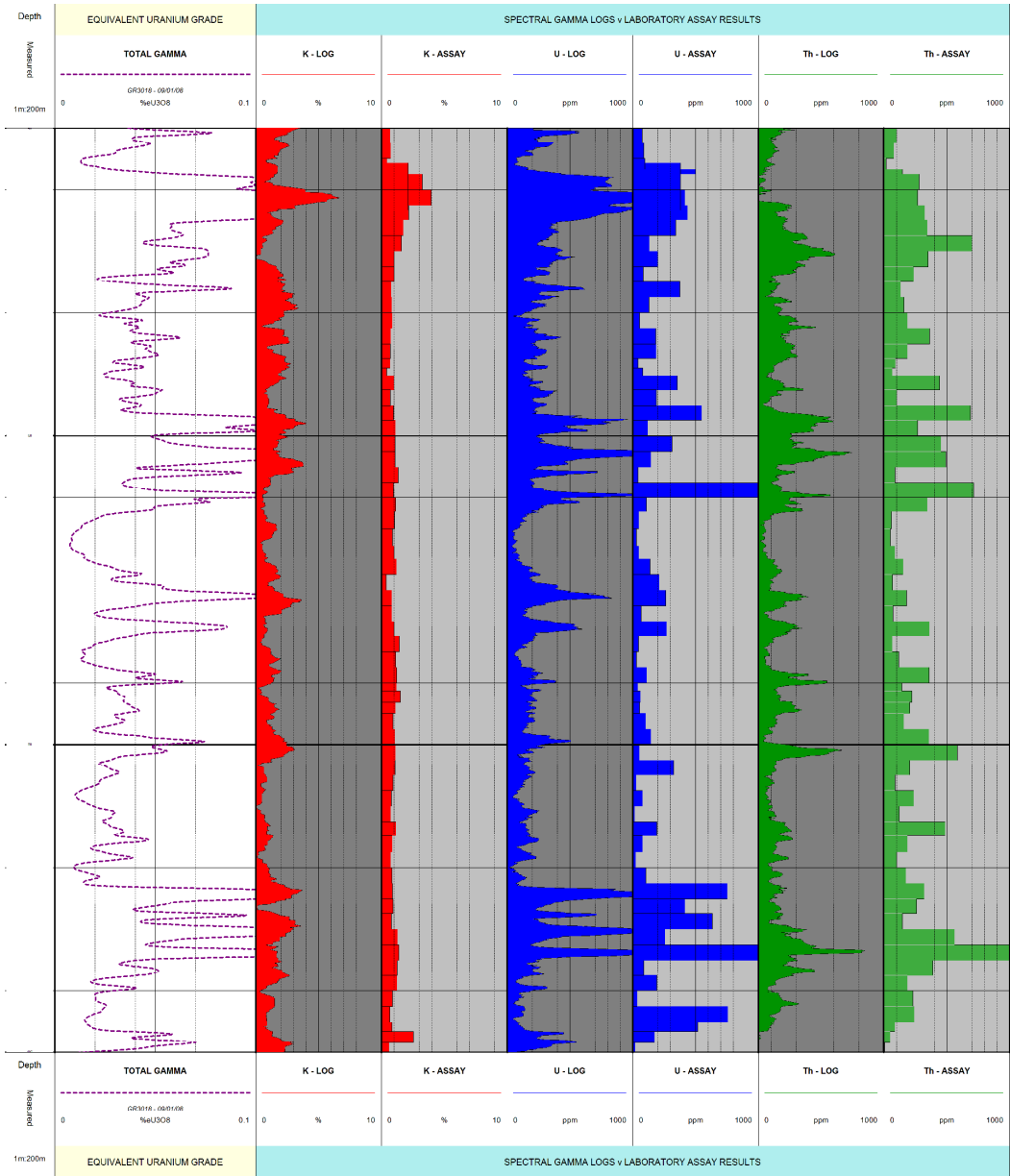


GEOPHYSICAL LOGGING PROBES

Spectral
Gamma

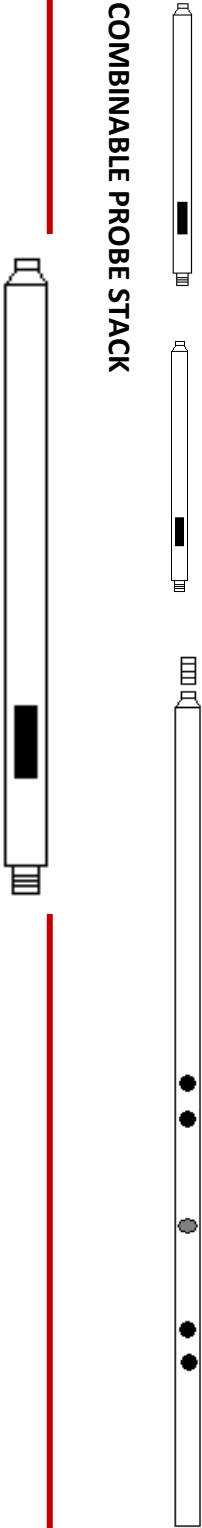
SGAM

SPECTRAL GAMMA LOGS v LABORATORY ASSAYS



SINGLE PROBE

COMBINABLE PROBE STACK





GEOPHYSICAL LOGGING PROBES

Filtered Gamma

Total Gamma (Geiger Mueller)

FGRS/TGGS

MEASUREMENT PRINCIPLE

Both gamma probes measure naturally occurring radioactivity. The most common naturally occurring radioactivity is associated with K^{40} , TH^{232} and $U^{232-238}$ which are associated with certain rocks (eg clays/shales) making the gamma curves an excellent lithological identifier tool.

The filtered gamma probe uses a scintillation system consisting of a sodium iodide crystal and a photomultiplier tube to measure gamma radiation. Additionally thin layers of lead, copper and brass are wrapped around the scintillation system. The purposes of the metal layers is to reduce the effect of the low energy gamma rays. Additionally, electronic thresholds can be set to further investigate certain areas of the gamma energy spectrum.

The total gamma (GM) probe measures gamma radiation through Geiger Mueller detectors. This probe is most commonly used in high grade uranium deposits where saturation of a scintillation detection system is common.

Ideally suited for:

- Uranium exploration and mining.
- High grade uranium exploration & mining – Total Gamma (GM).

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.
(Downhole logging can be recorded for QA purposes).

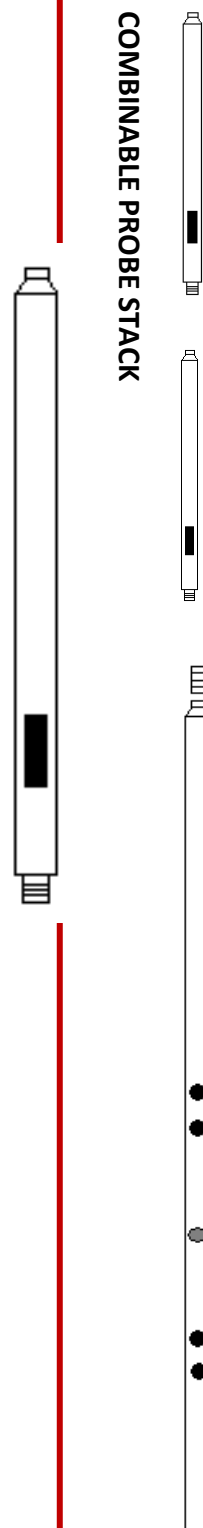
Final curve units can be counts per second, uranium grade in %eU₃O₈ or ppm_eU₃O₈

Calibration via Adelaide Models – AM1, AM2, AM3 & AM7.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:
Gamma, dual laterolog, dual induction conductivity, magnetic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

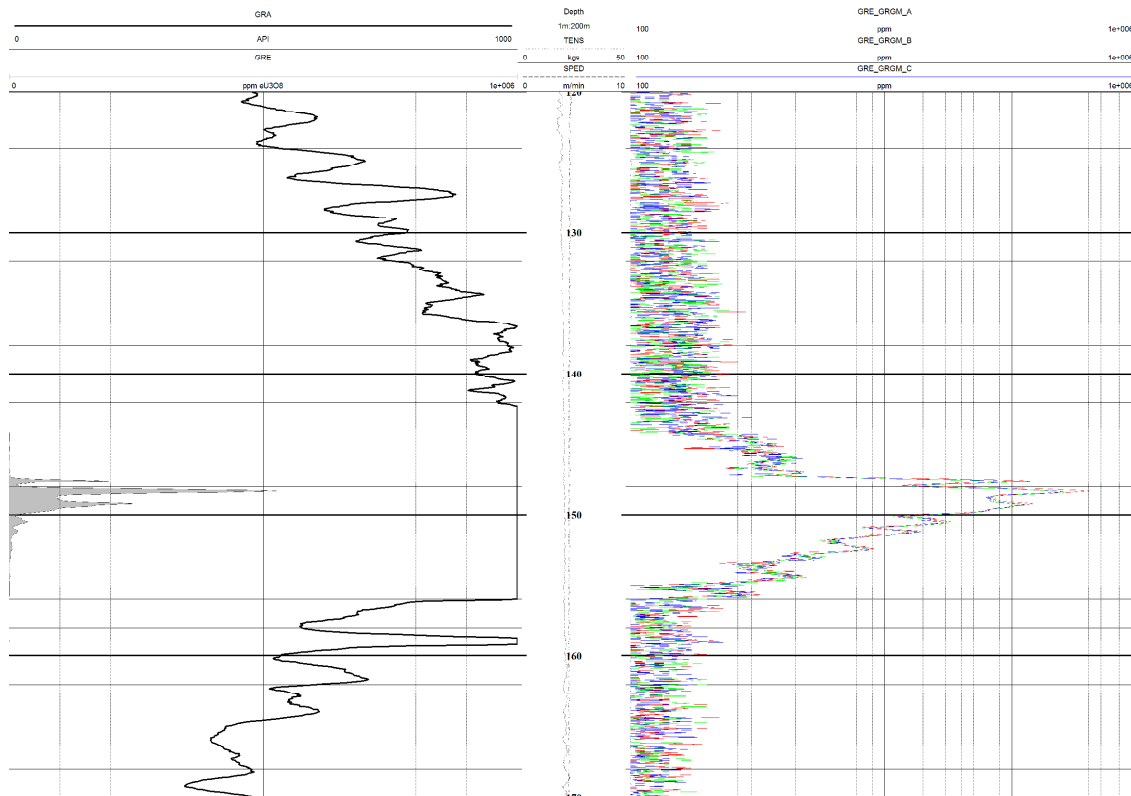
**PHYSICAL SPECIFICATIONS**

	FGRS	TGGS
Weight	8.0kg	5.0kg
Length	0.90m	0.7m
Diameter	45mm	38mm
Crystal size	25mm x 50mm	3 x GM detectors
Additional	Pb, Cu, Brass Shields	
Maximum Pressure	20 MPa	20 MPa
Maximum Temperature	80°C	80°C

GEOPHYSICAL LOGGING PROBES

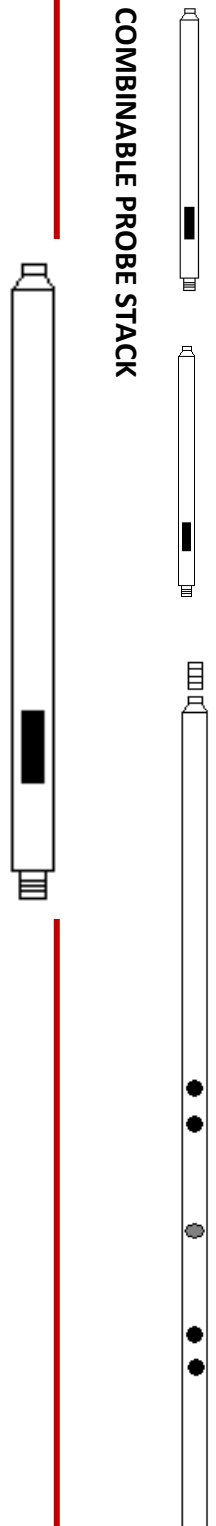
Filtered Gamma Total Gamma (Geiger Mueller)

FGRS/TGGS



SINGLE PROBE

COMBINABLE PROBE STACK





GEOPHYSICAL LOGGING PROBES

Filtered Gamma

Total Gamma (Geiger Mueller)

FGRS/TGGS

MEASUREMENT PRINCIPLE

Both gamma probes measure naturally occurring radioactivity. The most common naturally occurring radioactivity is associated with K^{40} , TH^{232} and $U^{232-238}$ which are associated with certain rocks (eg clays/shales) making the gamma curves an excellent lithological identifier tool.

The filtered gamma probe uses a scintillation system consisting of a sodium iodide crystal and a photomultiplier tube to measure gamma radiation. Additionally thin layers of lead, copper and brass are wrapped around the scintillation system. The purposes of the metal layers is to reduce the effect of the low energy gamma rays. Additionally, electronic thresholds can be set to further investigate certain areas of the gamma energy spectrum.

The total gamma (GM) probe measures gamma radiation through Geiger Mueller detectors. This probe is most commonly used in high grade uranium deposits where saturation of a scintillation detection system is common.

Ideally suited for:

- Uranium exploration and mining.
- High grade uranium exploration & mining – Total Gamma (GM).

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and/or fluid filled borehole.
- Open borehole and/or cased borehole.

Typically recorded in an uphole logging direction at logging speeds of 3 – 5 m/min.
(Downhole logging can be recorded for QA purposes).

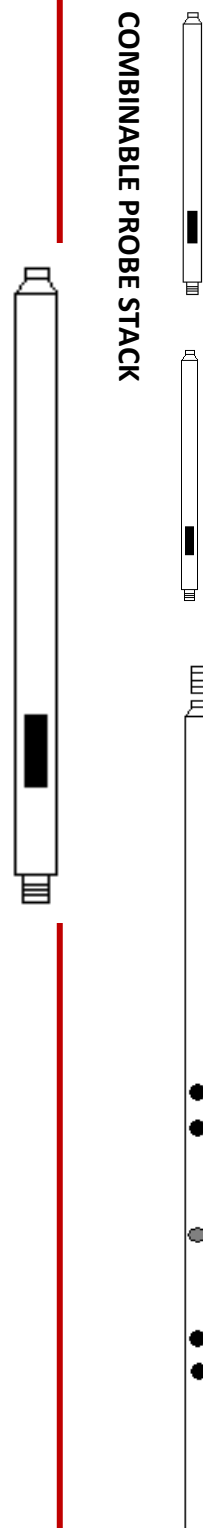
Final curve units can be counts per second, uranium grade in %eU₃O₈ or ppm_eU₃O₈

Calibration via Adelaide Models – AM1, AM2, AM3 & AM7.

Probes can be stacked to the top and the bottom of the probe. Typical combinations are:
Gamma, dual laterolog, dual induction conductivity, magnetic deviation.

SINGLE PROBE

COMBINABLE PROBE STACK

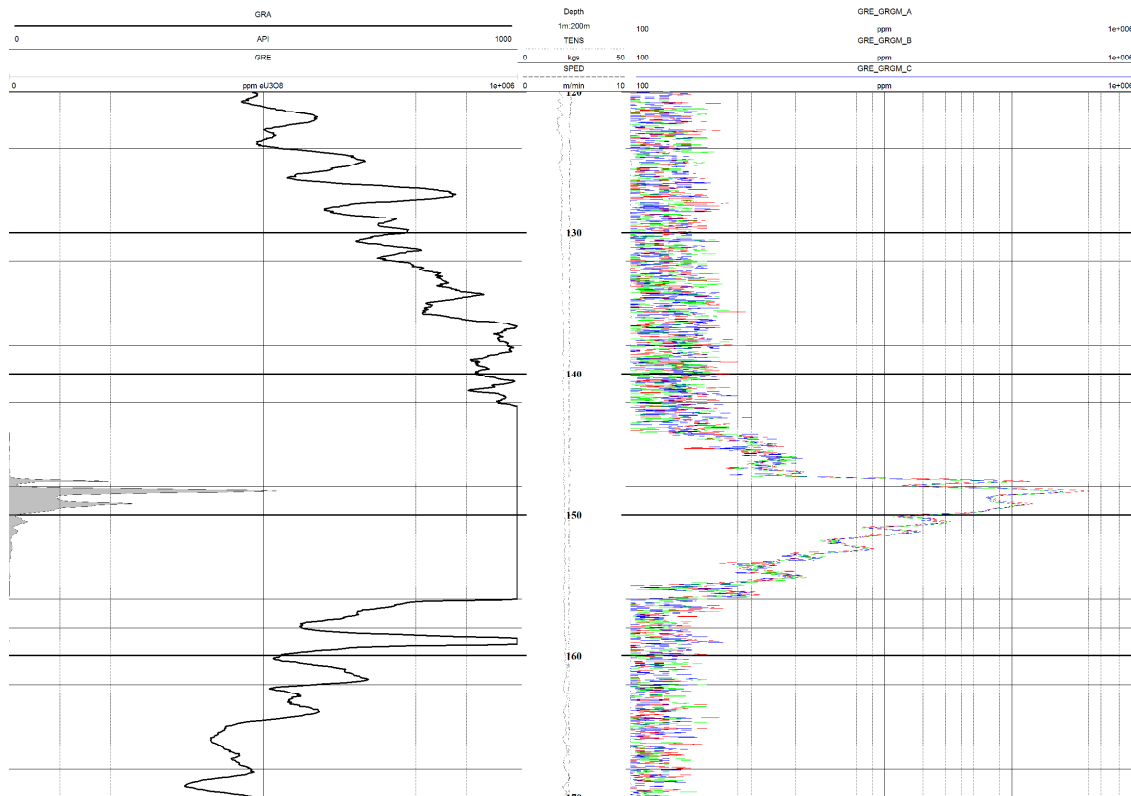
**PHYSICAL SPECIFICATIONS**

	FGRS	TGGS
Weight	8.0kg	5.0kg
Length	0.90m	0.7m
Diameter	45mm	38mm
Crystal size	25mm x 50mm	3 x GM detectors
Additional	Pb, Cu, Brass Shields	
Maximum Pressure	20 MPa	20 MPa
Maximum Temperature	80°C	80°C

GEOPHYSICAL LOGGING PROBES

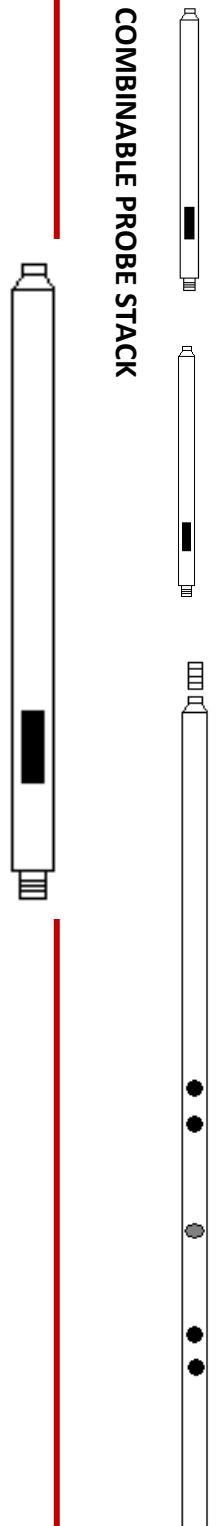
Filtered Gamma Total Gamma (Geiger Mueller)

FGRS/TGGS



SINGLE PROBE

COMBINABLE PROBE STACK



PROBES:

OTHER.

- Caliper: 2 Arm & 3 Arm
- CCTV Camera: Borehole Camera (downhole and Sideview)
- Fishing Fishing Operations

GEOPHYSICAL LOGGING PROBES

2 Arm/3 Arm Caliper

CALX/CAL3

MEASUREMENT PRINCIPLE

The caliper probe is a mechanical device used to measure the diameter of the borehole and the roughness (rugosity) of the borehole wall. The caliper probe has two options:

- Two arms set 180 degrees apart.
- Three arms set 120 degrees apart.

All caliper arms are fixed to a central mechanical rod inside the probe.

Combining two, two arm caliper probes allows for different directions in the borehole (X and Y) to be measured independently.

Ideally suited for:

- Casing inspection.
- Groundwater fracture identification.
- Borehole rugosity (rock hardness).
- Borehole volume calculations.
- Probe environmental corrections.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air or fluid filled borehole.
- Open and cased borehole conditions.
- Recorded in an uphole logging direction with caliper arms open at logging speeds of 7 – 8 m/min.

Final curve units can be counts per second, millimetres, centimetres or inches.
Calibration via measured calibration jig.

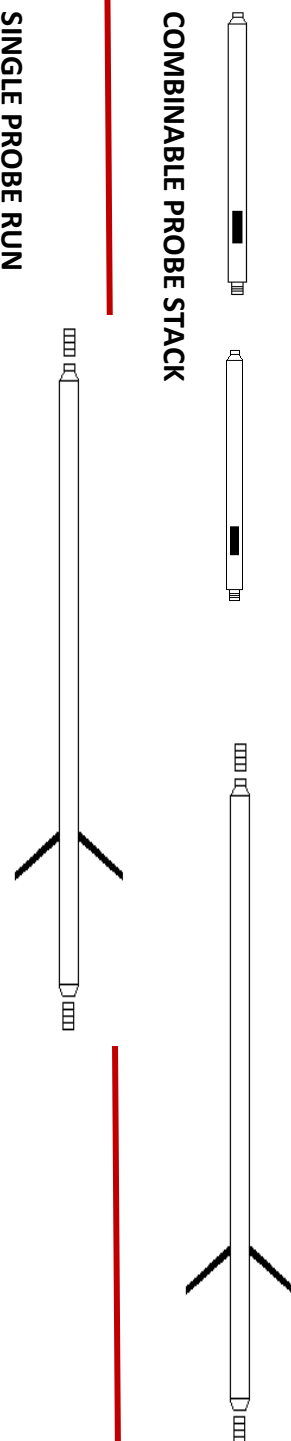
Probes can be stacked to the top and/or bottom of the probe. Typical combinations are:
Gamma, gamma & fluid temperature/conductivity, dual induction.

PHYSICAL SPECIFICATIONS

	3 ARM	2 ARM
Weight	5.5kg	5.5 kg
Length	1.37m	1.15m
Diameter	38mm	38mm
Accuracy	+/- 5mm	+/- 5mm
Maximum Pressure	20 MPa	20 MPa
Maximum Temperature	80°C	80°C

SINGLE PROBE RUN

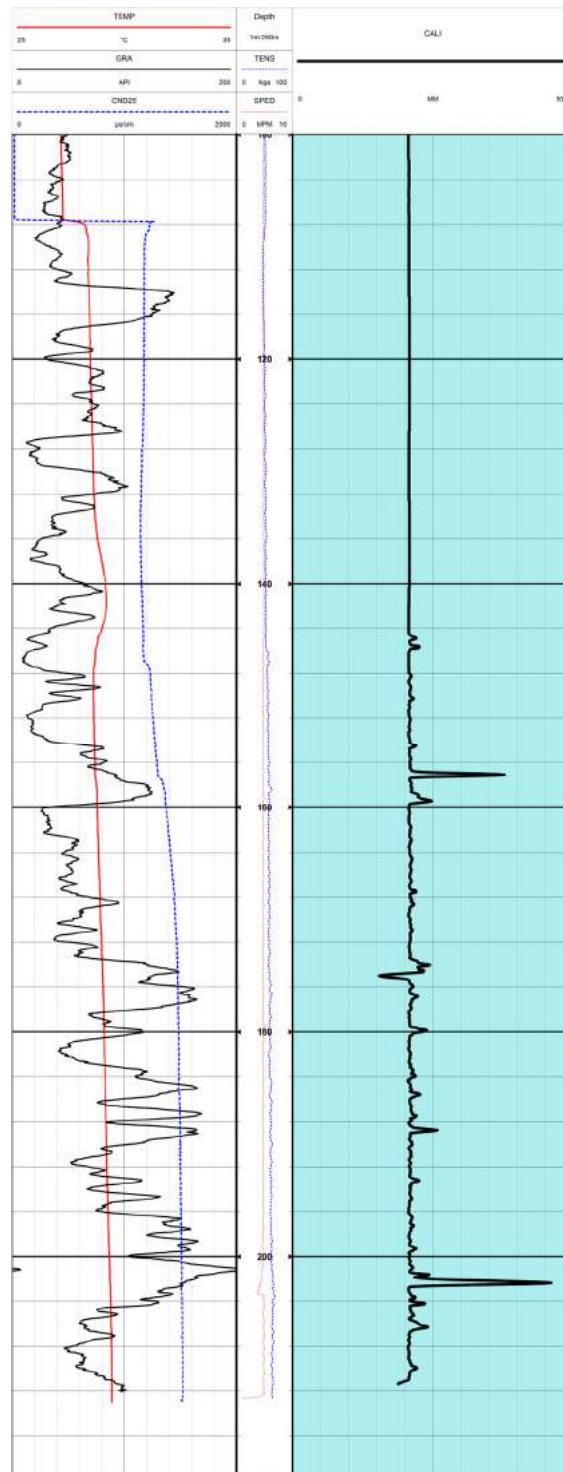
COMBINABLE PROBE STACK



GEOPHYSICAL LOGGING PROBES

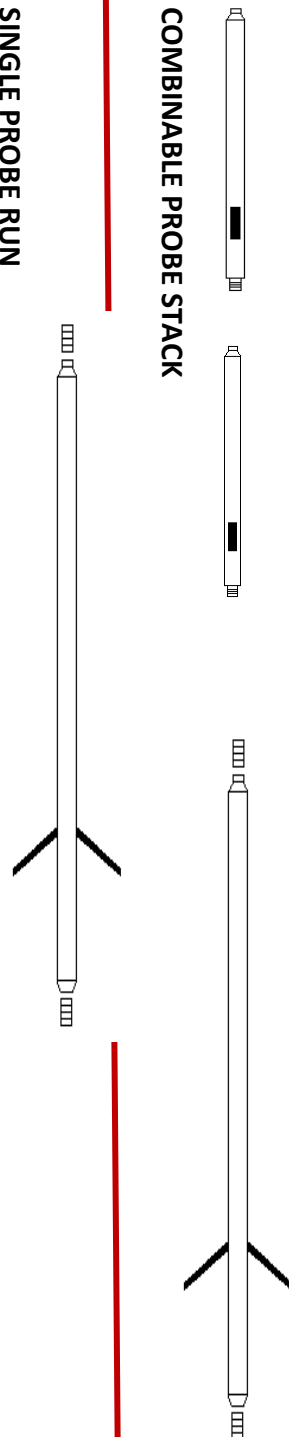
2 Arm/3 Arm Caliper

CALX/CAL3



SINGLE PROBE RUN

COMBINABLE PROBE STACK





GEOPHYSICAL LOGGING PROBES

Wireline Downhole Camera Borehole Inspection

WCAM

MEASUREMENT PRINCIPLE

The borehole CCTV camera operates on standard 4 conductor wireline and offers the convenience of both downhole and sidewall viewing facilities by switching between two individual cameras – one directly axial to the probe/borehole and the other directly radial to the probe/borehole with 360 degree infinite rotation.

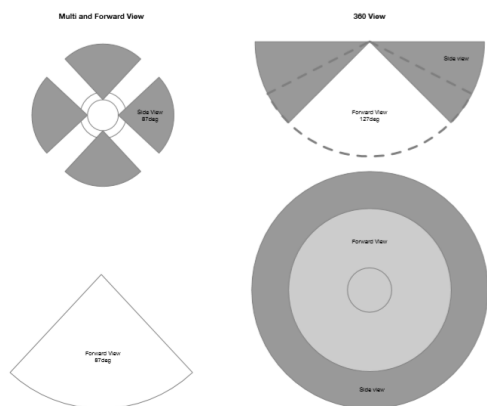
A combination of forward view, lateral view and quadrant views are available in real time, snapshots can be taken at any time followed by a download from the camera at the end of the survey for very high resolution images and video.

Ideally suited for:

- Groundwater investigations.
- Casing Surveys.
- Raise Bore Investigations.

Operations & Calibration:

- Minimum borehole diameter of 50mm.
- Air and fluid filled open and/or cased boreholes.



SINGLE PROBE



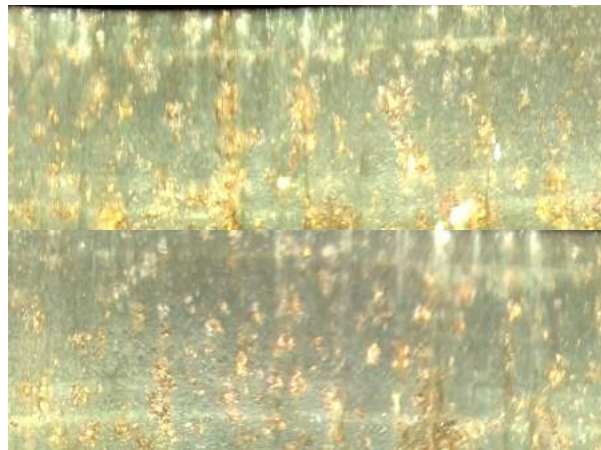
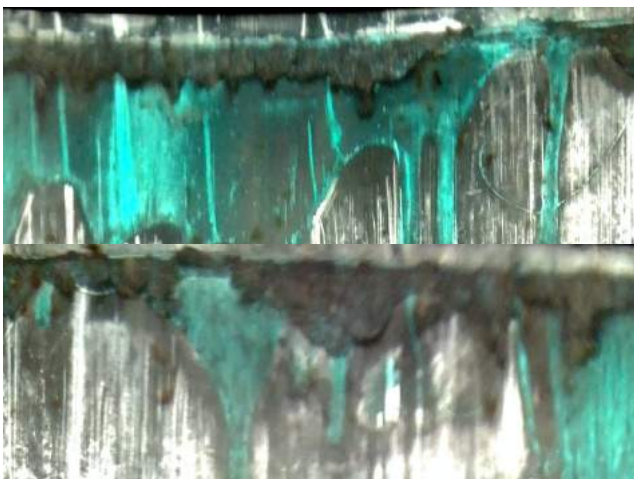
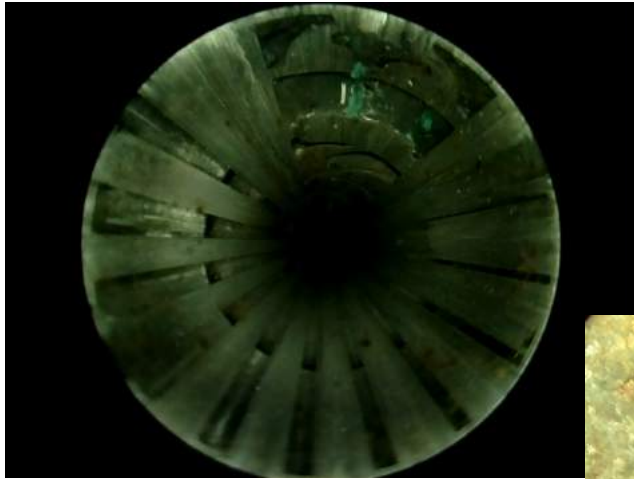
PHYSICAL SPECIFICATIONS

Weight	5.0kg
Length	0.75m
Depth accuracy	+/- 5cm
Maximum Pressure	20 MPa
Maximum Temperature	70°C
View Angle	180°, 360°, Fisheye
Frame Rate	10—15 fps
Resolution	1280 x 960
Video Format	MPEG4
Bit Rate	2 Mb/s

GEOPHYSICAL LOGGING PROBES

Wireline Downhole Camera Borehole Inspection

WCAM



SINGLE PROBE RUN





GEOPHYSICAL LOGGING PROBES

Probe Fishing Tool

FISH

OPERATIONAL PRINCIPLE

When a probe and/or stack becomes stuck or wedged in the borehole, Borehole Wireline has standard operating procedures to recover the probe/stack.

The probe fishing tool is designed for use with a drill rig and has a range of adaptors to connect to most mineral drilling strings. Features include:

- Side entry slot for the wireline to pass through the fishing tool.
- Catchers to fit on to the fishing lip at the top of the cablehead.



PHYSICAL SPECIFICATIONS	
Weight	20.0kg
Length	0.80m
Diameter	50mm