



COMPASS DIRECTIONAL GUIDANCE, INC. TECHNICAL DATA SHEET

Compass Gamma Module



Gamma ray tools record naturally occurring gamma rays in the formations adjacent to the wellbore. This nuclear measurement indicates the radioactive content of the formations. Effective in any environment, gamma ray tools are the standard device used for the correlation of logs in cased and open holes.

Gamma ray tools use a super sensitive hermetically sealed Sodium Iodide Scintillator crystal and a ruggedized high temperature Photomultiplier for maximum log quality.

Applications

- Depth determination
- Depth correlation within the well and between wells
- Lithology identification
- Qualitative evaluation of shaliness
- Qualitative evaluation of radioactive mineral deposits

Uses

- Distinguish shales from non-shales
- Estimate clay content in sands and limestones
- Correlation of real-time data with offset logs to determine geologic location
- Picking casing and coring point

Compass Gamma Module Specifications

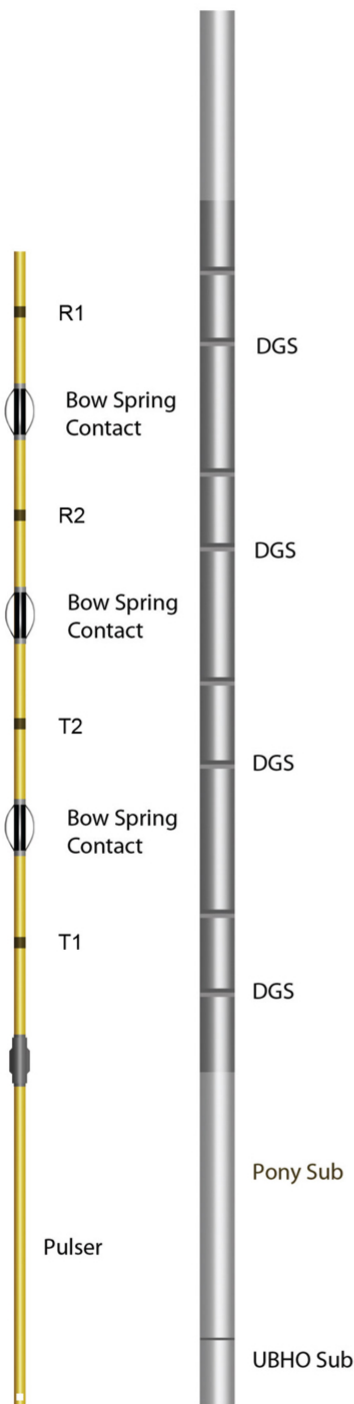
	Standard Module	Focused Module
Application	Logging/MWD	Geosteer/MWD
Mechanical		
Diameter	1.875"	1.30"
Length (make up)	34.05"	13.6"
Weight	15.0 lb.	3.0 lb.
Operating Temp.	-77° to +350° F.	-77° to +350° F.
End Connectors	200°, 10 Pin GE	MDM-15 Pin
Material	BeCu	BeCu
Pressure	18,000 PSI	18,000 PSI
Performance		
Sensitivity	1.7 Counts per API	0.6 Counts per API
Accuracy	+/- 5% to 300° F.	+/- 5% to 300° F.
	+/- 10% to 350° F.	+/- 10% to 350° F.
Resolution	6.8"	6.8"
Environmental		
Survival Temp.	400° F.	400° F.
Max Heat/Cool	5° F/Minute	5° F/Minute
Vibration (3 axis)		
	50-300 Hz	30 G.
Random	30 G.	30 G.
Shock (Z-axis)	500 G., 0.5 mS	500 G., 0.5 mS
Shock (Y-axis)	1000 G., 0.5mS	1000 G., 0.5mS
Power		
Input Voltage	22-30 Volts	22-30 Volts
Input Current	18-14 mA	18-14 mA
Maximum Voltage	31.5 Volts	31.5 Volts
Output Signal		
Pulse	+5V to 0V, 2(+/-0.5)	+5V to 0V, 2(+/-0.5)
	microseconds	microseconds





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Compass GEN II A Resistivity



Platform	Compass Mud Pulse Platform
Collar Sizes	96mm or 3 3/4" 121mm or 4 3/4" 165mm or 6 1/2" 203mm or 8"
Data	Real time as well as memory
Curves	Resistivity curves with gamma, option of inclination and ROP as requested. 2 – Frequency 2 – Depths of investigation Measurements up to 2000 ohms
Applications	The platform is the Mud Pulse which is fully retrievable. This same retrievability is available in the Gen II A resistivity package.
Probe O.D.	1 7/8" Used in monels and resistivity collar from 3.5" - 9.5". Fully retrievable sensor package.
Maximum Temperature	150° C. (302° F.)
Tool Power Source	High performance lithium batteries

Depth of Investigation				
Rock Matrix	40" @ 2MHz	80" @ 2MHz	40" @ 400KHz	80" @ 400KHz
Sandstone	0.32 meters	0.42 meters	0.61 meters	0.69 meters
Limestone	0.54 meters	0.61 meters	1.1 meters	1.17 meters
Shale	1.12 meters	1.18 meters	2.25 meters	2.28 meters

**Assumes OBM





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Version 1.0 Preliminary Data

Compass GEN II A Dual Frequency Resistivity

	40" Spacing	80" Spacing
2MHz	0.2-50 ohm-m	0.2-200 ohm-m

Depth of Investigation at 2MHz

Resistivity ohm-m	40" Spacing	80" Spacing
0.2 ohm-meter	0.25 meters	0.35 meters
2 ohm-meters	0.65 meters	0.75 meters
20 ohm-meters	2.0 meters	2.05 meters
50 ohm-meters	3.15 meters	3.2 meters
100 ohm-meters	4.45 meters	4.48 meters

Assumes Magnetic Permeability of 1.256e-6

Mechanical Specifications

Nominal Tool O.D.	4.75"	6.75"
Tool Length (meters)	4.1	4.1
Top Connection (Box)	3.5 IF	4.5 IF
Bottom Connection (Pin)	3.5 IF	4.5 IF
Make Up Torque (Ft/lbs.)	8500	25000
Max DLS (deg/30m)	25	25
Max Operating Temp. (deg. C)	150	150
Max Operating Pres. (Psi)	20,000	20,000
Max Flow Rate (cubic meters)	1.6	2.25
Max Sand Content	1%	1%
Recorder Capacity (Hours)	300 hours	300 hours
Power Requirements	28V, 25AH Lithium	28V, 25AH Lithium
Battery Life (28V, 25AH) approx.	175 hours	175 hours
Sample Rate Interval "Flow On"	15 seconds	15 seconds
Sample Rate "Flow Off"	Sleep Mode	Sleep Mode
Max ROP (m/hr) @ 0.2 meter sample intervals	48 m/hr	48 m/hr

Accurate Measurement Ranges

Outside of these ranges it is still **possible** for the tool to measure resistivity, however no guarantee of the accuracy of that measurement can be made.

	40" Spacing	80" Spacing
400KHz	0.2-100 ohm-m	0.2-100 ohm-m

Depth of Investigation at 400KHz

Resistivity ohm-m	40" Spacing	80" Spacing
0.2 ohm-meter	0.49 meters	0.58 meters
2 ohm-meters	1.42 meters	1.48 meters
20 ohm-meters	4.45 meters	4.48 meters
50 ohm-meters	7.05 meters	7.08 meters
100 ohm-meters	9.98 meters	9.99 meters

Vertical Resolution

* These numbers will be constant because of the transmitter receiver configuration.

	Spacing		
	40"	80"	
1 ohm meter Rt			
Vertical Resolution	1.01 meter	2.032 meters	2MHz
Vertical Resolution	1.01 meter	2.032 meters	400KHz

	Spacing		
	40"	80"	
100 ohm meter Rt			
Vertical Resolution	1.01 meter	2.032 meters	2MHz
Vertical Resolution	1.01 meter	2.032 meters	400KHz

