Measurement while drilling instrument

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As is well known, one of the main functions of MWD is to measure the geometric parameters of the wellbore. Directional well engineers will adjust the actual drilling trajectory based on real-time uploaded inclinometer data toachieve the expected design trajectory effect.

Based on the drilling conditions, our MWD company has mainly developed products in two directions: hightemperature resistance and high seismic resistance MWD; The second is MWD with dynamic continuousinclinometer measurement and real-time transmission capabilities.

GroundSystem

- High speed and high-precision ground acquisition;
- Waterproof, sunscreen, explosion-proof display system;
- Decoding of small and micro signals;
- Real time data remote transmission, convenient for monitoring and management;
- Clear data display (curves, programs);
- Support data playback and traceability.

SignalTransmissionSystem

Key Features:

- Suitable for high displacement and high torque working conditions;
- Suitable for working conditions where plugging agents are used;

- Suitable for a wider range of mud densities and various complex working conditions;
- It can store and record the working torque, vibration, total power consumption, temperature and other parameters of the motor, and can expand the engine power supply;

BasicParameters:

Instrument outer diameter	38/40/48mm
Hanging outer diameter	89-241mm
Displacement range	6-76L/s
sediment concentration	<3%
Operating Temperature	below zero 40℃-175℃
pressure resistance	20000Psi
power supply range	28-40V

MeasurementSystem:

- **Accurate measurement**

Using high dynamic response MEMS accelerometers for attitude measurement, high-speed and high-resolution acquisition circuits synchronously sample acceleration and flux gate signals, and techniques such as Kalman digital filters (a recursive estimation algorithm based on state space models designed specifically for dynamic system state estimation) are employed to ensure measurement accuracy;

- **High temperature stability of electronic components**

When selecting components for the 175 ℃ probe, high-temperature resistant devices are used to ensure long-term stable operation in harsh environments at 175 ℃;

- **High quality circuit board**

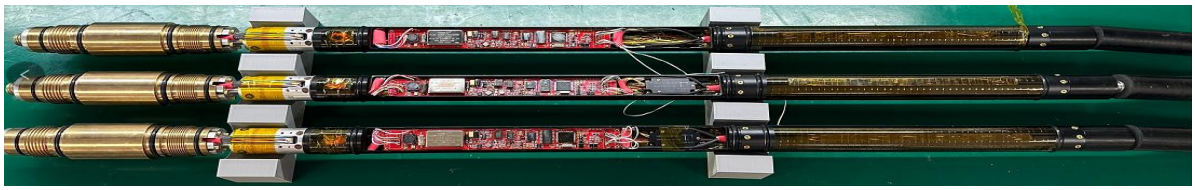
The 175 ℃ probe tube circuit board is made of high-temperature sheet metal (TG280 sheet metal, glass transition temperature>280 ℃), with immersion gold and lead-free processes. The fully automatic machine is used for high-temperature mounting and welding to prevent softening and virtual soldering problems of the circuit board in high-temperature and high vibration environments underground;

- **Low power consumption of power supply**

Compared with similar products, the power consumption of the 175 ℃ probe is very low, with a current of less than 20mA, which is only 1/4 of the power consumption of similar products. Wide range of power input: 16-40V, therefore, multiple types of batteries can be connected, with typical applications of 28V or 36V;

General Technical Conditions		
Operating Temperature		135 ℃/175 ℃
work pressure		20000Psi
vibration	sine	30 G（20-800 Hz）
	random	25 Grms（20-500 Hz）
impact		1000G 0.5ms

Technical specifications of directional measuring instrument			
		measurement accuracy	measurement range
inclination angle		±0.1°	0～180°
azimuth	inclination angle≥5°	±1.5°	0～360°
	inclination angle≥8°	±1.0°	
	inclination angle＝90°	±0.5°	
Tool face angle		±0.5°	0～360°



Azimuth gamma

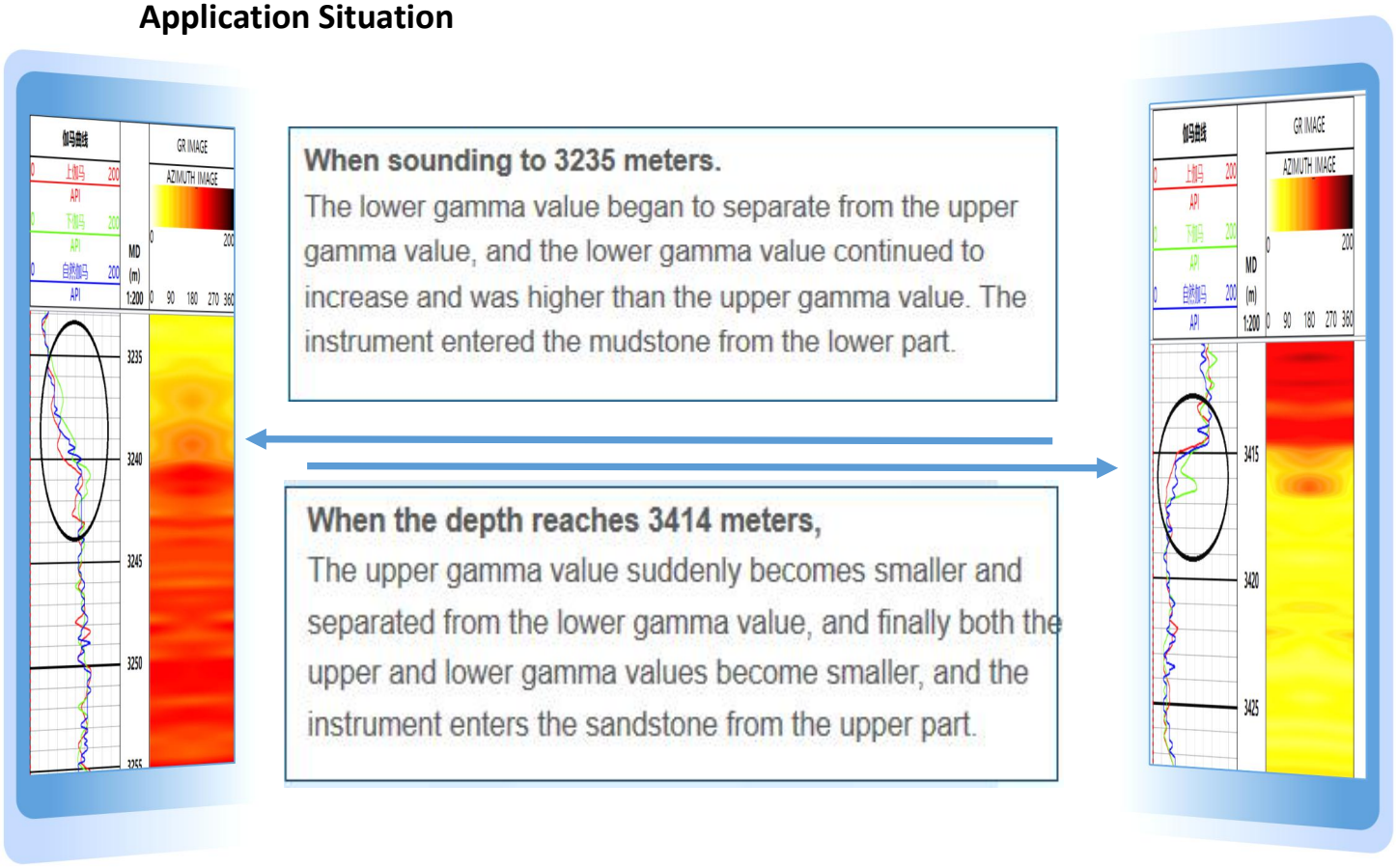
Functional Features an：

- High voltage noise reduction;
- High-speed acquisition signal;
- Power consumption reduction;
- Driving Voltage;
- Rapid tool surface;
- Near-bit deviation;
- Stratigraphic dip problem;

Technical Specifications：

serial number	project	parameter
1	Sodium iodide crystal	24 x 150(mm)
2	photomultiplier	RXXXX
3	diameter	35.1（mm）
4	length	390（mm）
5	connector	Micro-D15pin
6	material	Alloy aluminum for aerospace
7	Effective window	±45°
8	sensitivity	1.8±0.2API/CPS
9	precision	≤150℃ @ ±5%
		≤175℃ @ ±10%
10	measuring range	500API
11	Vertical resolution of strata	100（mm）
12	Working temperature	-10℃ 175℃
13	Extreme survival temperature	190℃
14	Temperature gradient	3℃/min
15	Vibration (3 axes)	(5-1000)Hz @ 20G
16	lash	Zaxis @ 500G，0.5mS
		X 或 Yaxis @ 1000G，0.5mS
17	input voltage	17-42VDC
18	Power consumption current	9-12mA@DC28V

Application Situation



When sounding to 3235 meters.

The lower gamma value began to separate from the upper gamma value, and the lower gamma value continued to increase and was higher than the upper gamma value. The instrument entered the mudstone from the lower part.

When the depth reaches 3414 meters,

The upper gamma value suddenly becomes smaller and separated from the lower gamma value, and finally both the upper and lower gamma values become smaller, and the instrument enters the sandstone from the upper part.