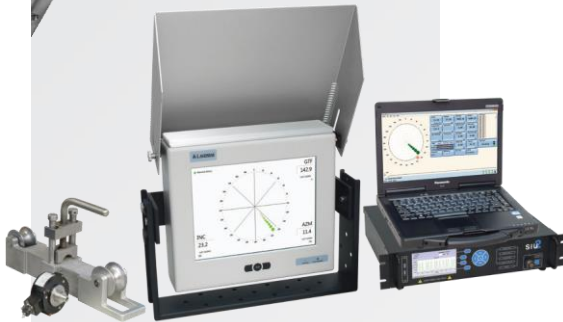


SureShot™ MWD System

SureShot-MP

Fixed-mount
Pulser



Standard APS Surface System



Printrex
Plotter

APS's SureShot family of directional and directional plus gamma systems provides reliable and flexible measurement-while-drilling performance in combination with our fourth & Fifth generation Rotary Pulser. The system can be powered by our battery modules, our turbine alternator, or a combination of the two. This MWD system provides highly accurate azimuth and inclination data for all applications from straight-hole through horizontal drilling. Rapid and accurate toolface transmission enables the most complex well paths to be drilled with confidence.

SureShot's downhole portion includes a rugged directional sensor package with NIST-traceable magnetometer calibration; a reliable, field-proven, Rotary Pulser*; and battery and/or turbine alternator for power. SureShot's modular design allows the addition of other functions like high-quality gamma and/or vibration logging. Each package is protected by a state-of-the-art vibration isolation system and is mounted in ToughMet alloy or NT50 alloy or INC718 pressure barrels. A small, robust surface decoder interfaces with a computer running APS's SureShot Control Center software. The SureShot MWD can store up to 32 MB of MWD/LWD and diagnostic data for retrieval during trips.

SureShot's patented fourth & fifth-generation Rotary Pulser* is the toughest, most advanced, most LCM-tolerant mud pulse transmitter in the industry. Our pulser's ultra-reliable, high-efficiency DC brushless motor and controller, single open-flow path, positive pulse output and anti-jamming control virtually eliminates jamming or blockage, and the on-board memory allows post-run analysis of pulser performance. The Rotary Pulser is easily converted between fixed-mount and retrievable configurations.

The SureShot system is easy to learn, assemble and operate. In fact, APS's customers frequently train their personnel themselves to operate our system.

- > The highly reliable APS fourth & fifth-generation Rotary Pulser converts easily from fixed-mount to retrievable, providing fixed-mount reliability or retrievable lost-in-hole security.
- > Additional sensors including gamma, vibration monitoring, resistivity, iPZIG and rotatory steerable tool can be quickly incorporated into our SureShot MWD platform system.
- > The surface system presents data in a simple, user-friendly control and display module. The data is transferred to a central control PC from which it can be directed back to a dedicated wireless rig-floor display and/or rig monitoring system.
- > Multiple encoding schemes and advanced decoding enable rapid customization of the data stream for maximum speed or maximum data integrity.
- > APS enables multiple data output format, including ASCII, LAS, WITS and WITSML.
- > The unique APS power management module enables the system to be powered through dual battery packs or a combination of battery power and APS turbine alternator †.

*U.S. Patents #6,714,138 and #7,327,634

† U.S. Patent #7,201,239

SureShot™ MWD System

SureShot-MP

Retrievable
Pulser with
Stinger



Low-temperature
Rig Floor Display



Advanced Decoding Software

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Specifications subject to change without notice.

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Surface System																					
System Components	SIU2, Laptop, Plotter, Rig Floor Display, Transducer, Electric cable etc.																				
SIU2 & Plotter Voltage	100-240VAC, 47-63 Hz, 13W																				
SIU2 & Plotter Temps	0 ~ 70°C (32 to 158°F) Operating; -10 ~ 85°C (14 to 185 °F) Storage																				
Printrex Plotter	Real time printing survey data with APS Plot™																				
Standard Rig Floor Display	Certified Zone 1 Division 2; 9 in; wireless -20° to 60°C (-4 to 140 °F) operating; -40° to 75°C (-40 to 167 °F) storage																				
Low temperature Rig Floor Display	Certified Zone 1 Division 2; 15 in; wired/wireless -40° to 50°C (-40 to 122 °F) operating; -40° to 85°C (-40 to 167 °F) storage																				
Pressure Transducer	4 - 20 mA current loop; certified intrinsically safe Class 1 Division 1, Class 1 Zone 0 -40° to 121°C (-40 to 250 °F) operating; -55° to 150°C (-67 to 302 °F) storage																				
Hook Load Sensor	4 - 20 mA current loop; certified intrinsically safe Class 1 Division 1, Class 1 Zone 0 -40° to 80°C (-40 to 180 °F) operating; -40° to 125°C (-40 to 257 °F) storage																				
Depth Encoder	Standard NAMUR Type; certified intrinsically safe Class 1 Zone 0 -40° to 80°C (-40 to 180 °F) operating; -40° to 125°C (-40 to 257 °F) storage																				
Downhole Tools																					
Downhole String	Pulser, Battery (or TA), Directional Sensor, plus Gamma and other sensors																				
Data Rate	MPT≥1bps; EM ≥12bps (Option)																				
Pulser Mounting	Fixed mount, Retrievable or Floating (string anchored at bottom)																				
Pulser Operation	Reciprocating oscillating (shear valve style)																				
Pulser Height	Adjustable																				
Activation	Electromechanical																				
Operating Voltage	28-40V DC																				
Sonde OD & Materials	47.63mm (1.875in); ToughMet Alloy, NT50 Alloy (option) or INC718 Alloy (option)																				
Power Supply	Battery (1 or more pack) or Turbine Alternator																				
Sand Content	Sand ≥3% by volume recommended																				
Mud type	Oil-base mud, Water-base mud; (EM for air, N2, foam UBO)																				
Flow Sub O.D. & Flow Flow Ranges	<table border="1"> <tr> <td>9.5" or larger:</td> <td>650 ~ 1200 gpm</td> <td>241mm or larger:</td> <td>41 ~ 76 L/Sec</td> </tr> <tr> <td>8":</td> <td>300 ~ 1200 gpm</td> <td>203mm:</td> <td>18.9 ~ 76 L/Sec</td> </tr> <tr> <td>6.25" ~ 6.75":</td> <td>150 ~ 750 gpm</td> <td>159mm ~ 171mm:</td> <td>9 ~ 47 L/Sec</td> </tr> <tr> <td>4.75":</td> <td>125 ~ 350 gpm</td> <td>121mm:</td> <td>7.9 ~ 22 L/Sec</td> </tr> <tr> <td>3.125" & 3.5":</td> <td>70 ~ 250 gpm</td> <td>79mm & 89mm:</td> <td>4 ~ 16 L/Sec</td> </tr> </table>	9.5" or larger:	650 ~ 1200 gpm	241mm or larger:	41 ~ 76 L/Sec	8":	300 ~ 1200 gpm	203mm:	18.9 ~ 76 L/Sec	6.25" ~ 6.75":	150 ~ 750 gpm	159mm ~ 171mm:	9 ~ 47 L/Sec	4.75":	125 ~ 350 gpm	121mm:	7.9 ~ 22 L/Sec	3.125" & 3.5":	70 ~ 250 gpm	79mm & 89mm:	4 ~ 16 L/Sec
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LCM Tolerance	50 lb/bbl medium nut plug 143 kg/m3 medium nut plug																				
Operating Temperature	-25° to 150°C (-4 to 302°F); 175°C (350°F) (option)																				
Max Operating Pressure	Standard: 20,000 Psi (140MPa); High pressure: 25,000 Psi (175MPa) or Ultrahigh pressure: 30,000 Psi (210Mpa) (Option)																				
Data Exported Formats	ASCII, LAS, WTIS, WITSML																				
Dogleg Capability	API connection limited																				
Pulser	G4 & G5 (with Flow MC, more power efficiency and higher data rate)																				
Sensor	Tri-axial fluxgate magnetometer with NIST-traceable calibration; quartz accelerometer with rotating INC and rotating AZI feature																				
Inclination Range/Accuracy	0° to 180° / ± 0.1°																				
Azimuth Range/Accuracy	0° to 360° / ± 0.75° (Inc > 10°, Dip < 70°)																				
Tool Face Accuracy	Gravity: ± 1° (Inc > 10°); Magnetic: ± 0.5° (Dip < 70°)																				
System Expansion																					
LWD Option	PWD, Gamma, AziGM, WPR, iPZIG, iPCD, FWSonic, iDNSC																				
Drilling Optimization	VMS, DDM, AVD, RSM, RSS																				