

Memory PS Platform Production Services

APPLICATIONS

- Three-phase production logging
- Vertical and deviated wells
- Well monitoring during perforating operations
- Formation stimulation evaluation
- Depth correlation
- Reservoir and production monitoring
- Transient analysis
- Periods of multilayer testing
- Cement evaluations

When surface readout operations are not possible, PS Platform* new-generation production services can be configured for memory measurements by replacing the internal surface readout telemetry cartridge in the basic measurement sonde with a memory module and battery. The resulting Memory PS Platform* production services platform maintains the flexibility of sensor and tool combinations regardless of the mode of conveyance used to deliver three-phase production logging measurements. It also maintains the same accuracy and high quality as those sensor and tool combinations from the real-time system. Operating software supports acquisition, onsite data quality control, validation, and wellsite presentations.

The Memory PS Platform basic measurement string is compact—only 4.1 m [13.5 ft]—and consists of the following tools:

- platform basic measurement sonde—provides gamma ray and casing collar log data for correlation, as well as pressure and temperature measurements.
- flow-caliper imaging sonde—measures the average fluid velocity, water and hydrocarbon holdups, and bubble counts from four independent probes; and provides dual-axis caliper and relative bearing measurements.
- additional services that combine with the Memory PS Platform toolstring:
 - Gradiomanometer* specific gravity profile sonde—measures the average density of the wellbore fluid for holdup derivations with an accelerometer measurement to correct for well deviation.
 - PS Platform inline spinner—determines fluid velocity in high flow-rate environments.
 - Additional UNIGAGE* pressure gauge carrier sonde—features a quartz pressure gauge.
 - FloView* holdup measurement imaging tool with four additional water holdup probes—helps identify the flow regime by measuring water holdups and bubble count with greater wellbore coverage.
 - GHOST* Gas Holdup Optical Sensor Tool—uses fiber-optic technology to directly measure gas and liquid holdups.
 - SCMT* Slim Cement Mapping Tool—evaluates cement quality and integrity around the casing.

Mechanical Specifications

Temperature rating, degC [degF]	150 [302]
High-temperature version, degC [degF]	200 [392]
Pressure rating, Sapphire* gauge, MPa [psi]	69 [10,000]
Pressure rating, high-pressure Sapphire gauge, MPa [psi]	103 [15,000]
Pressure rating, CQG* gauge, MPa [psi]	103 [15,000]
Min. borehole size	Depends on toolstring configuration
Max. borehole size	Depends on toolstring configuration
OD, mm [in]	42 [1.6875]
With rollers, mm [in]	54 [2.125]

Memory PS Platform Production Services

Measurement Specifications

	Basic Measurement Sonde	Flow-Caliper Imaging Sonde	Gradiomanometer Sonde	GHOST Tool	FlowView Tool	Memory SCMT Tool
Output	Gamma ray, casing collar locator, pressure (Sapphire pressure or CQG Crystal Quartz gauge), temperature	Fluid velocity, relative bearing, water holdup, bubble count, bubble size, x + y caliper	Fluid density, well deviation	Gas holdup, bubble size, caliper, relative bearing	Water holdup, bubble count, bubble size, caliper, relative bearing	Variable Density* log (VDL), cement bond log (CBL), travel time, cement compressive strength
Logging speed	Depends on application	Variable	Depends on application	Depends on application	Stationary to variable based on application	549 m/h [1,800 ft/h]
Range of measurement	Sapphire gauge: 6.9–69 MPa [1,000–10,000 psi]; high-pressure Sapphire gauge: 6.9–103 MPa [1,000–15,000 psi]; CQG gauge: 0.1–103 MPa [14.5–15,000 psi]; temperature: ambient to 150 degC [302 degF]	Caliper diameter: 5.1–27.9 cm [2–11 in]	0–2.0 g/cm ³	Gas holdup: 0%–100%; caliper: 5.1–22.9 cm [2–9 in]	Caliper: 5.1–22.9 cm [2–9 in]	Depends on formation and casing
Vertical resolution	Point of measurement	Point of measurement	38.1 cm [15 in]	Point of measurement	Point of measurement	CBL: 0.91 m [3 ft] VDL: 1.52 m [5 ft]
Accuracy	Sapphire gauge: ±41,370 Pa [±6 psi] (accuracy), 689 Pa [0.1 psi] (resolution); high-pressure Sapphire gauge: ±89,632 Pa [±13 psi] (accuracy), 1,379 Pa [0.2 psi] at 1-s gate time (resolution); CQG gauge: ±6,894 Pa [±1 psi] plus 0.01% of reading (accuracy); 69 Pa [0.01 psi] plus 69 Pa [0.01 psi] at 1-s gate time (resolution); temperature: ±1 degC [±1.8 degF] (accuracy), 0.006 degC [0.011 degF] (resolution)	Caliper: ±5.1 mm [±0.2 in] (accuracy); 1.0 mm [0.04 in] in diameter (resolution)	±0.04 g/cm ³ (accuracy); ±0.002 g/cm ³ (resolution)	Gas holdup between 2% and 98%: ±1% (otherwise without probe protector: ±5%, with probe protector: ±7%); caliper: ±5.1 mm [±0.02 in]	Water holdup: ±5% (±2% > 90%) [†] ; relative oil flow rate: ±20%	Depends on formation and casing
Depth of investigation	Borehole	Borehole	Borehole	Borehole	Borehole	CBL: casing and cement interface VDL: depends on bonding and formation
Mud type or weight limitations	None	Min. salinity of all wellbore fluids: 2,000 ppm at 25 degC [77 degF]; 1,000 ppm at 100 degC [212 degF]; 700 ppm at 150 degC [302 degF]	Measurement not in horizontal wells	None	Min. salinity of all wellbore fluids: 2,000 ppm at 25 degC [77 degF]; 1,000 ppm at 100 degC [212 degF]; 700 ppm at 150 degC [302 degF]	None
Combinability	With all PS Platform tools	With basic measurement sonde (required) and all PS Platform tools	With basic measurement sonde (required) and all PS Platform tools	With basic measurement sonde (required) and all PS Platform tools	With basic measurement sonde (required) and all PS Platform tools	Exclusively with basic measurement sonde
Special applications	H ₂ S service	H ₂ S service	H ₂ S service	H ₂ S service	H ₂ S service	H ₂ S service

[†] Valid for bubble size greater than 2 mm [0.08 in] and deviation less than 30°.