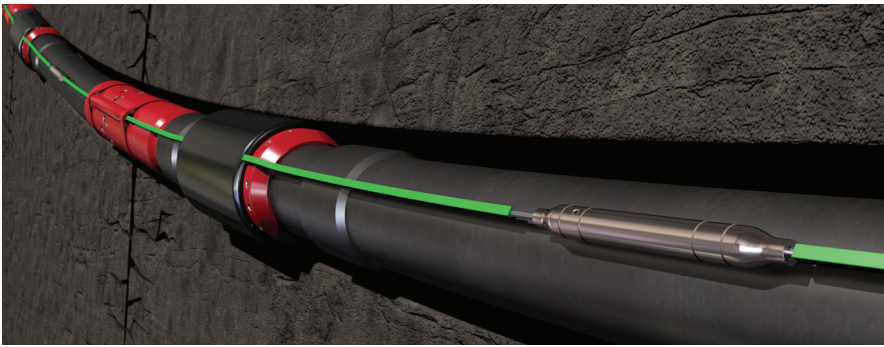


DataSphere® Array System

RELIABLE MULTI-POINT RESERVOIR MONITORING



HAL47913

OVERVIEW

The DataSphere® Array system is the next step in the evolution of DataSphere permanent monitoring suite. The technology is built upon the reliability of ROC™ gauge hybrid technology and provides greater system customization by deploying multiple discrete sensors across challenging wellbore regions.

A system comprised of conventional gauges can communicate with multiple Array sensor systems distributed across different wellbore intervals. Each Array system provides discrete real-time annular downhole distributed multi-point temperature and pressure monitoring data. The Array system incorporates no cable terminations, which reduces installation time and eliminates risks associated with multiple terminations. Furthermore, the Array system uses internal short circuit protection circuitry that minimizes system line takedowns.

Based on an industry-standard, field-proven resonating quartz crystal sensor, the Array system can be used for distributed, single zone, or multi-zone monitoring applications.

In distributed monitoring, the use of Halliburton conventional downhole gauges can be enhanced by the Array system, allowing operators greater visibility into their operations efficiency in a cost-effective manner.

APPLICATIONS

- » ICD efficiency monitoring
- » Production monitoring
- » Injection monitoring
- » Field reservoir monitoring
- » SmartWell® completion system optimization
- » Artificial lift/gas lift optimization
- » Pressure gradient monitoring

FMJ CABLE TERMINATION

When connected to a conventional gauge, the DataSphere Array system uses a high-performance cable termination with a sealing arrangement based on our highly reliable intelligent completion FMJ connector. This cable termination incorporates a pressure-testable dual metal-to-metal ferrule seal arrangement for isolating the downhole cable outer metal sheath from the well fluid.

FEATURES

- » Can be deployed standalone
- » Up to 50 sensors per array
- » ROC-MODBUS communication protocol
- » Designed for harsh environments up to 16,000 psi and 175°C
- » AWES qualified
- » Reduced OD design
- » Multi-drop capability on single core tubing encased conductor (TEC)
- » Hermetically sealed electron beam-welded design
- » Application Specific Integrated Chip (ASIC) technology
- » Increased capabilities such as fault protection per sensor
- » Designed for a 10 year life at 185°C

BENEFITS

- » Quartz-sensors provide high accuracy and resolution and low drift
- » Can be deployed across the sandface for greater reservoir inflow/outflow understanding
- » Reduces rig time through faster installation times (up to eight hours saved per gauge)
- » Reduces need for cable terminations
- » Eliminates requirement for gauge mandrels in annular sensing applications
- » Validates/disproves reservoir models
- » Tool head voltage and gauge current measurement for diagnostics
- » Reduces potential leak points by minimizing system connections

TESTING

The individual sensor design has gone through the Design for Reliability process, which includes a Highly Accelerated Lifetime Test (HALT) program. This program is a series of controlled environmental stresses designed to ensure that stringent criteria are met for thermal shock, mechanical shock, vibration and thermal aging. During manufacture, all gauges are also subjected to Environmental Stress Screening (ESS) to highlight any defect in functionality prior to installation at the well site. This method of screening has proven to be far more effective than "burn-in" techniques.

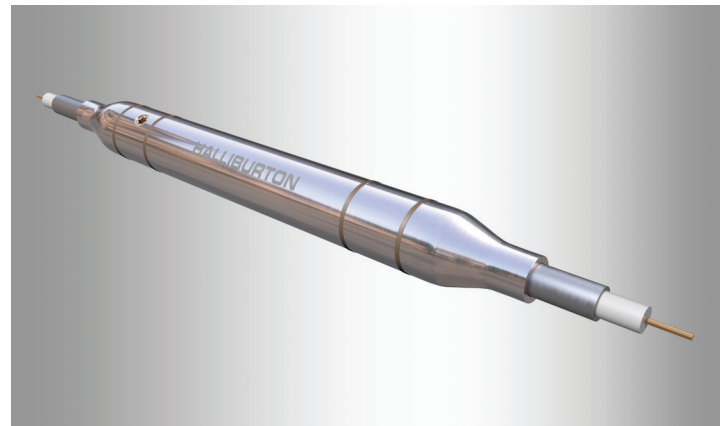
All of the individual sensors that make up the DataSphere Array system are independently calibration-checked in our manufacturing facility. During Factory Acceptance Testing (FAT), the DataSphere Array sensor welds are pressure tested for integrity as the array is being built and spooled onto the final drum.

DataSphere® Array System - Temperature Performance

Accuracy (°C)	0.5
Typical Accuracy (°C)	0.15
Achievable Resolution (°C/sec)	< 0.005
Repeatability (°C)	< 0.01
Drift at 177°C (°C/year)	< 0.1

DATASPHERE ARRAY SYSTEM DESIGNS

- » Quartz transducer and hybrid technology
- » ASIC technology
- » Maximum 175°C operating temperature
- » Can be used in conjunction with existing gauges
- » Improved shock and vibration performance
- » 0.625-in. OD ultra slim design
- » Less than 7-in. length per sensor
- » Does not need a gauge mandrel to be deployed
- » Short-circuit protection per sensor, prevents line takedowns



Temperature and Pressure Sensor > The DataSphere® Array system is comprised of multiple ultra slim, highly accurate quartz-based temperature and pressure sensors.

DataSphere® Array System - Pressure Performance

Pressure Range (psi / bar)	0 to 10,000 / 0 to 690	0 to 16,000 / 0 to 1,100
Accuracy (% FS)	0.015	0.02
Typical Accuracy (% FS)	0.012	0.015
Achievable Resolution (psi/sec)	< 0.006	< 0.008
Repeatability (% FS)	< 0.01	< 0.01
Response Time to FS Step (for 99.5% FS)	< 1 sec	< 1 sec
Acceleration Sensitivity (psi/g – any axis)	< 0.02	< 0.02
Drift at 14 psi and 25°C (%FS/year)	Negligible	Negligible
Drift at Max. Pressure and Temperature (%FS/year)	0.02	0.02

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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