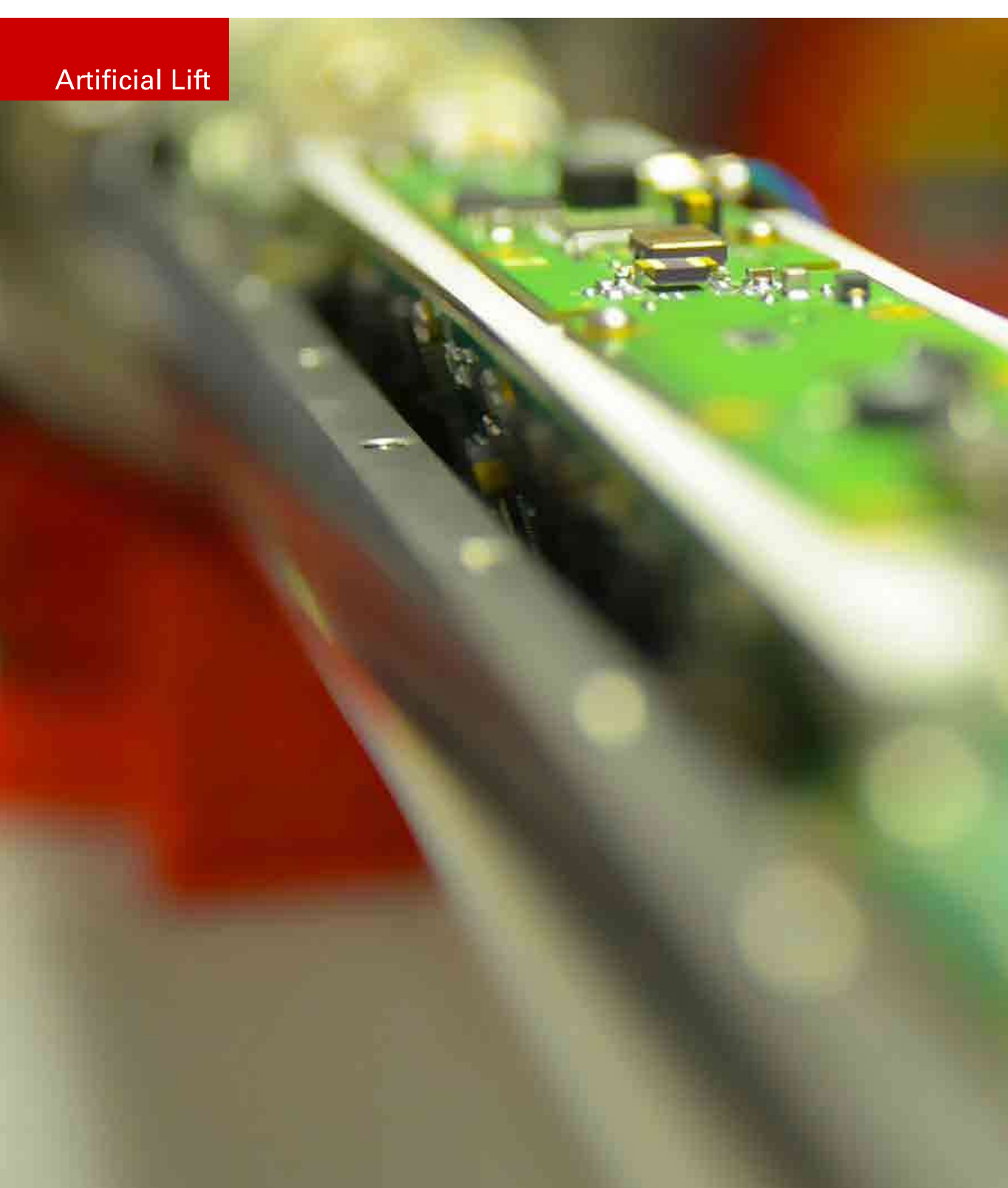
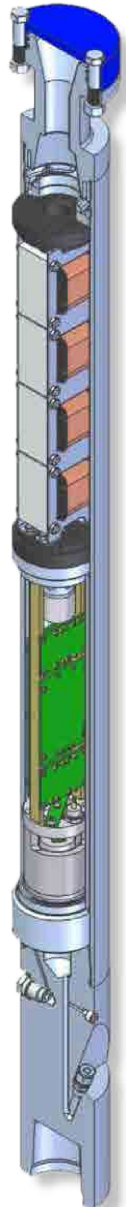


Artificial Lift



Downhole
Gauges



Downhole Gauges

Summit ESP® – A Halliburton Service offers a suite of gauges that, in conjunction with our advanced surveillance package, provides real-time monitoring of downhole electric submersible pump (ESP) equipment to enhance operational efficiency, minimize downtime and optimize production.

Our gauges are engineered to monitor critical operating parameters to instantly head off any potential issues that could damage the ESP and result in expensive workovers and delayed production. The gauges ensure that downhole performance remains steady within predetermined limits that, if exceeded, can shut down the ESP system.

All Summit ESP gauges are easily connected to our real-time well surveillance package, which allows operators to remotely adjust operating parameters to maximize run life and production. All gauges measure the following six channel readings: intake pressure, temperature, motor temperature, vibration, current leakage and voltage imbalance. This is the basic data required to protect your ESP equipment and extend run life.

FEATURES

- » Easy integration into Summit ESP® variable-speed drives and switchboards
- » Gauge information displayed directly on the drive interface
- » Simple, two-wire connection to the Summit ESP monitoring system
- » Summit ESP monitoring systems allow for remote access to surface and downhole information, including well surveillance system
- » Custom alarming and notification configured directly on the drive

BENEFITS

- » Optimizes production through real-time monitoring and proactive problem solving
- » Provides user-friendly setup and operation, requiring no calibration and minimal training for field personnel
- » Prevents premature failures and associated workover costs
- » Requires no maintenance
- » Maximizes operational life by transmitting data through ESP cable

Hellcat™ Gauges

Hellcat™ gauges continuously monitor intake pressure, intake temperature, motor temperature, vibration, current leakage, and voltage imbalance. Each gauge communicates bottomhole pressures and temperatures over our ESP cable and directly to the Summit ESP ACS®-15 variable-speed drive. The communication network includes a user-friendly interface for analyzing well performance in real time. The highly reliable transducer design ensures accurate readings, forewarning of issues that threaten the integrity of downhole equipment.

- » The Hellcat M6-125 gauge has a maximum intake temperature of 257°F (125°C).
- » The Hellcat M6-150 gauge has a maximum intake temperature of 302°F (150°C).
- » The Hellcat M7-150 gauge has a maximum intake temperature of 302°F (150°C).
- » The Hellcat M7-150 gauge has an additional channel to include discharge pressure, giving a complete picture of the downhole operational condition and offers maximum protection to pinpoint holes in the tubing, plugging, or similar issues that can adversely affect pump performance. Changes in vibration identify mechanical component issues, while the discharge pressure provides pump performance indicators.
- » The Hellcat™ D6-150 or D7-150 gauge is selected when critical downhole information is required based upon an increased data acquisition rate. Parameters are user configurable for priority assignment, and data acquisition rates are extremely fast compared to standard products. These units are ideal for pressure rate buildup, as they provide the capability to track parameters as well conditions change, and to generate better characterization of reservoir conditions during drawdown. The Hellcat D6-150 and D7-150 gauges require a high-speed surface interface or modification of existing equipment to provide high-speed data. Customer flexibility for data extraction is an excellent benefit of this gauge.

Hellcat™ Gauge Technical Specifications

Specifications	M6-125	M6-150/D6-150	M7-150/D7-150
Six or Seven Channels	P _i , T _i , T _m , V _{xy} , V _i , C _l	P _i , T _i , T _m , V _{xy} , V _i , C _l	P _i , P _d , T _i , T _m , V _{xy} , V _i , C _l
Transducer Type	Capacitance	Capacitance	Capacitance
Maximum Intake Pressure*	5,000 psi	5,000 psi	5,000 psi
Maximum Discharge Pressure*	5,000 psi	5,000 psi	5,000 psi
Pressure Accuracy**	± 0.2% Full Scale	± 0.2% Full Scale	± 0.2% Full Scale
Pressure Resolution	± 0.1 psi	± 0.1 psi	± 0.1 psi
Maximum Intake Temperature***	125°C (257°F)	150°C (302°F)	150°C (302°F)
Temperature Accuracy	± 2°C	± 2°C	± 2°C
Temperature Resolution	± 0.1° C	± 0.1°C	± 0.1°C
Maximum Motor Temperature	260°C (400°F)	260°C (400°F)	260°C (400°F)
Vibration (X & Y Axis)	18 g	18 g	18 g
Vibration Resolution	0.055 g	0.055 g	0.055 g
Voltage Imbalance (Wye Point)	1500 V	3000 V	3000 V
Current Leakage Range	0-50 mA	0-50 mA	0-50 mA
Current Resolution	0-50 µA	0-50 µA	0-50 µA
Maximum Voltage	3000 V	5000 V	5000 V
Diameter	3.75 in.	3.75 in.	3.75 in.
Length	25.0 in.	38.0 in.	49.0 in.
Housing Material	Carbon or Stainless	Carbon or Stainless	Carbon or Stainless

* 6,500-psi and 10,000-psi options available – requires high-speed unit

** 0.1% full-scale accuracy available upon request

*** 177°C rated gauges available upon request

P_i = Intake Pressure

P_d = Discharge Pressure

T_i = Intake Temperature

T_m = Motor Winding Temperature

V_{xy} = Vibration, X and Y Axis

V_i = Voltage Imbalance 9 (Wye Point)

CL = Current Leakage

High-Temperature Gauges

The multi-parameter Summit ESP® high-temperature downhole gauge attaches to the bottom of the downhole motor and provides key data regarding the operating environment of the pumping system, such as pump intake pressure and pump temperature, as well as discharge pressure. The downhole gauge is equipped with a resistance temperature detector (RTD) to monitor motor winding temperature. The vibration feature measures both the x and y axis, and detects increasing vibration caused by worn or damaged pump and motor components or increased solids content within the fluid. Other external influences may also cause increased vibration. This data provides the operator with information to help protect the ESP system. A variety of adaptors is available to fit many different ESP motors. The circuitry and transducer are sealed at the factory for maintenance-free operation and high reliability. With its rugged transducer and reliable design, the gauge can help optimize production, reduce downtime, and prevent premature and premature pump failure.

Surface Monitoring System

Bottomhole pressure, temperature data, and vibration data are transmitted to the surface, using the ESP system's power cable, and received by the surface monitoring system. For continuous monitoring of submersible equipment performance, the received data is integrated with the variable-speed drive and Summit ESP® remote well surveillance system, and displayed in appropriate engineering units for pressure, temperature, and vibration monitoring. Data is archived and may be accessed locally or remotely by the operator. The Summit ESP® surface monitoring system uses Modbus RS-232 and RS-485 protocols.



High-Temperature Gauge Technical Specifications

	Range	Accuracy	Resolution
Intake Pressure	0–8,000 psi*	+/- 0.25% **	Up to .01 psi
Discharge Pressure	0–8,000 psi*	+/- 0.25% **	Up to .01 psi
Intake Temperature	0–177°C (32–350.6°F)	2°C (35.6°F)	-17.8°C (-0.04°F)
Vibration (X and Y Axis)	0–10g	0.5%	.001g
Current Leakage	N/A	N/A	N/A
Maximum Temperature			
Motor Temperature	316°C (600.8°F)		
Maximum Motor Voltage			
Electrical	4160 V		
	Diameter	Length	Housing
Mechanical	10 cm (3.94 in.)	58.5 cm (23 in.)	Stainless Steel

* Other pressure range available upon request

** Requires readout unit with integral display

Surface Monitoring Unit Technical Specifications

Power	115 VAC Stainless Steel
Operating Temperature	-18°C to 50°C (-0.4°F to 122°F)
Certifications	UL/CSA Stainless Steel
Communication	Modbus, 1200 to 19200 Baud
Modbus Port	RS-232, RS-485 Isolated
Diagnostics	LEDs
Electrical Access	4 Post Power/Gauge Terminal Blocks