ForeSite® Sense Pods

Provide digital pressure, temperature, and vibration measurements

Applications

- Reservoir monitoring
- Vibration monitoring
- Artificial-lift monitoring
- Zonal-isolation monitoring
- Controller input signal for automation
- Pressure and temperature applications

Features and Benefits

- Large transducer output signal provides accurate pressure measurement.
- Highly repeatable sensor output under pressure and temperature cycling delivers reliable pressure data.
- Rugged gauge design improves resistance to mechanical shock and vibration.
- Resistance to fluids (including CO_2, H_2S, brines, and well-treatment acids or alkalis) enables accurate gauge operation in demanding downhole environments.

Description

Weatherford ForeSite Sense pods solutions are offered in five different models that are built on a common platform to measure pressure, temperature, and vibration at intake, at discharge, or at both. These digital gauges produce a large transducer output signal, which simplifies processing and minimizes the effect of measurement circuit errors.

Each Pods gauge undergoes a comprehensive series of environmental stress tests to screen out problematic assemblies and confirm that all gauges meet stringent criteria for thermal shock, mechanical shock, and thermal aging:

- Subassemblies: Initial electronics burn-in, cyclic temperature and pressure testing
- Gauges: Extended pressure and temperature testing over the full calibrated operating range

Options

- Multiple pressure ranges available—up to 10,000 psi (689.5 bar)—to maximize data accuracy and resolution for specific well environments
- Stainless steel or Inconel® construction
- Available with temperature ratings of 125°C or 150°C

ForeSite Sense Pods deliver accurate temperature, pressure, and vibration measurements in challenging environments.

Inconel is a registered trademark of Special Metals Company.

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Models

Weatherford offers five different models of Pods digital electronic gauges to meet any application requirement.

- **Pods-s** gauges acquire single-point pressure and temperature measurements
- **Pods-mv** gauges measure vibration in addition to pressure and temperature. Vibration measurements (in Grms) and vibration frequency data can assist in tubing wear or rod part diagnostics and aid in understanding flow-induced production-string vibrations, rod string harmonics, and vibrations associated with valve activations.
- **Pods-m** gauges transmit a proprietary protocol when addressed. The addressable scheme enables multiple gauges to communicate on the same, single-conductor power cable.
- **Pods-dm** and **Pods-dmv** gauges reduce electromechanical connections and terminations downhole. In applications where multiple measurements are required, using a single gauge to obtain dual pressure and temperature and optional vibration measurements will increase system reliability and longevity.

Specifications

General

Model*	Pods-dm	Pods-dmv	Pods-mv	Pods-m	Pods-s
Overall length with cable head	28.4 in. (72.1 cm)	28.4 in. (72.1 cm)	26 in. (66 cm)	24 in. (60.9 cm)	14.8 in. (37.5 cm)
Weight	3.6 lb (1.63 kg)	3.6 lb (1.63 kg)	2.8 lb (1.27 kg)	2.6 lb (1.18 kg)	1.9 lb (0.86 kg)
Diameter	1.125 in. (28.575 mm)	1.125 in. (28.575 mm)	1.0 in. (25.4 mm)	1.0 in. (25.4 mm)	1.0 in. (25.4 mm)
Pressure seals	Welded	Welded	Metal-to-metal	Metal-to-metal	Metal-to-metal
Maximum gauges per well	Up to 6	Up to 3	6	12	1
Drift	<2 psi/yr				
Sensitivity	Equal to resolution (calibrated repeatedly)				
Power consumption	80 mA	94 mA	54 mA	40 mA	10 mA

Temperature

Model*	PodS-dm	PodS-dmv	PodS-mv	PodS-m	PodS-s
Gauge type	Integral to pressure				
Range	59 to 257°F (15 to 125°C) 59 to 302°F (15 to 150°C)				59 to 257°F (15 to 125°C)
Accuracy	±1.8°F (±1.0°C)				
Resolution	0.1°F (0.055°C)				

Vibration Data Measurement

Model*	PodPT-dm	PodPT-dmv	PodPT-mv	PodPT-m	PodPT-s
Frequency	–	0 to 400 Hz		–	–
Grms	–	0 to 30 G		–	–

***Model naming convention**
s = single
m= multidrop
d = dual
v = vibration

ForeSite® Sense Pods

Specifications (continued)

Pressure

Model*	Pods-dm	Pods-dmv	Pods-mv	Pods-m	Pod-s
Gauge type	Piezo resistive				
Range	0 to 1,500 psi (0 to 103.4 bar) 0 to 3,000 psi (0 to 206.8 bar) 0 to 5,000 psi (0 to 344.7 bar) 0 to 7,500 psi (0 to 517.1 bar) 0 to 10,000 psi (0 to 689.5 bar)				
Accuracy	0.075%FS (typ 0.05% FS)				0.10% FS (typ 0.07% FS)
Resolution	0.002% FS				0.01% FS

Shock and Vibration

Model*	Pods-dm	Pods-dmv	Pods-mv	Pods-m	Pods-s
Vibration (random) G_{rms}	30 G Navmat				20 G Navmat
Shock	200 G 1 ms half sine all axis				500 G 1 ms half sine all axis
Frequency	0 to 2000 Hz				

***Model naming convention**

s = single
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d = dual
v = vibration

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Electronic Gauge Mandrel

The ForeSite Sense electronic gauge mandrels provide a means for mounting a pressure/temperature (P/T) gauge on the completion string. Each mandrel is machined from single billet, with no welds, to provide mechanical protection along the full length of the gauge. A metal-to-metal interface between gauge and mandrel enhances sealing reliability.

Configurations of the gauge mandrel are available to support above-packer and interzonal monitoring requirements as well as single- or multi-gauge configurations for redundancy or tubing- and annulus-pressure measurement.

The gauge mandrel meets all completion sizes while maintaining full bore ID. It supports control-line bypass for applications requiring chemical-injection or intelligent-well configurations where control lines are required for flow-control valves.

Features and Benefits

- Mandrel alloys are compatible with metals used in completion design.
- Premium threads and connections comply with completion design.
- Design accommodates single or multiple gauges with splitter block assembly.

Specifications

- Designed to API 5CT specifications
- Burst and collapse pressure calculated per API 5C3

ForeSite® Sense Pods

Electrical Downhole Cable

The ForeSite Sense electrical downhole cable provides a reliable pathway to transmit data for in-well pressure and temperature sensing systems. It also provides power to the downhole gauge.

The tubular encapsulated conductor (TEC) uses a 0.25-in. (6.35 mm) diameter armor tube to encapsulate the electrical conductor. The cable is available in either 0.028-, 0.035-, or 0.049-in. (0.71-, 0.89-, or 1.24 mm) armor wall thickness. The electrical conductor is copper. Conductor 'tinning' or 'plating' is dependent upon the service temperature, to 302° or 392°F (150° or 200°C).

Between the conductor and armor tube ID, filler and insulator materials are used to centralize and enhance mechanical integrity to the cable system, as well as insulate the electrical conductor from the armor. All cables are pressure tested and undergo the standard 'Eddy Current Testing' process.

Features and Benefits

- Encapsulation in a variety of polymeric materials is offered to suit a range of well conditions.
- Stranded core maximizes power and telemetry transmission characteristics.
- Process enhancements such as improved core concentricity, diameter tolerance and surface finish improve reliability.
- Installation technique isolates and protects the cable from stress, thus enhancing reliability throughout the life of the well.

Specifications

Physical Properties

Tube wall thickness	0.028 in (0.71 mm)	0.035 in. (0.89 mm)	0.049 in. (1.24 mm)
Tubing OD	0.25 in. (6.35 mm)		
Working pressure: 316L stainless steel	10,000 psi (689.48 bar)	15,000 psi (1034.21 bar)	20,000 psi (1378.95 bar)
Working pressure: INCOLOY® 825*	10,000 psi (689.48 bar)	15,000 psi (1,034.21 bar)	20,000 psi (1,378.95 bar)
Collapse pressure: 316L stainless steel	20,000 psi (1,378.95 bar)	30,000 psi (2,068.43 bar)	40,000 psi (2,757.90 bar)
Collapse pressure: INCOLOY 825	20,600 psi[1] (1,420.32 bar)	29,600 psi[1] (2,040.85 bar)	40,000 psi (2,757.90 bar)
Weight (bare): 316L stainless steel	87 lb/kft (130 kg/km)	100 lb/kft (149 kg/km)	100 lb/kft (149 kg/km)
Weight (bare): INCOLOY 825	88 lb/kft (131 kg/km)	101 lb/kft (150 kg/km)	124 lb/kft (185 kg/km)

[1] At 302°F (150°C)
* INCOLOY is a trademark of the Special Metals Company

ForeSite® Sense Pods

Electrical Downhole Cable (continued)

Specifications (continued)

Electrical Properties

Capacitance at 68°F (20°C): 316L stainless steel	26 pF/ft (85.3 pF/m)	32 pF/ft (104.9 pF/m)	36 pF/ft (118.1 pF/m)
Capacitance at 68°F (20°C): INCOLOY 825	26 pF/ft (85.3 pF/m)	32 pF/ft (104.9 pF/m)	36 pF/ft (118.1 pF/m)
Conductor DC resistance at 68°F (20°C)	7 Ohms/kft (23 Ohms/km)		
Voltage rating	1,000 Vdc		
Insulation resistance (minimum)	6,500 Mohms/kft (21,325 Mohms/km)		

*Manufacturer temperature rating in nominal test environment

Typical Encapsulation Options

Material	Material Temperature Rating*
Polypropylene	302°F (150°C)
Santoprene	302°F (150°C)
Nylon 11 (Rilsan)	275°F (135°C)
PVDF	302°F (150°C)
ETFE (Tefzel)	302°F (150°C)
ECTFE 350LC	302°F (150°C)
ECTFE 902 (Halar)	347°F (175°C)
FEP	392°F (200°C)
MFA/PFA	392°F (200°C)

*Manufacturer temperature rating in nominal test environment

Material

Conductor	7-strand tin copper – 18 AWG
Insulator	Tefzel (ETFE): 302ºF (150ºC)* or Flouropolymer: 392ºF (200ºC)
Filler Layer	Polypropylene: 302ºF (150ºC) or Flouropolymer: 392ºF (200ºC)

*Manufacturer temperature rating in nominal test environment

ForeSite® Sense Pods

Cable Protector

The ForeSite Sense cable protector supports single or multiple cables and control lines outside the tubing to prevent damage or stretch where the cable or control line crosses pipe joints, safety valves, crossovers, and other associated downhole hardware.

Weatherford provides a wide range of cable protectors to suit different types of well-monitoring applications. The type of cable protector required depends upon completion configuration, wellbore geometry, and well type. The cable protector is customized for specific tubing sizes, thread types, materials, coupling dimensions, number of cable or control lines, encapsulation size of cable or control lines, and overall dimension requirements inside the casing.

The one-piece assembly has no loose parts, with the bolting inbuilt to the protector. Using a pre-engaged swing bolt enables easy fitting and torqueing during installation, which saves rig time and reduces the risk of cable damage. If needed, cable protector refurbishment is offered where practical.

The protectors, which are ductile yet hard-wearing and reliable, are highly resistant to steady-state shock and shock loads. The standard protectors withstand high axial loads up to 30 tons (67,200 lbf) and high lateral loads up to 20 tons (44,800 lbf).

Protector material is all-cast carbon steel or stainless steel, which conforms to NACEMR0175 for sour wells. For optical or electronic cables, Weatherford provides predominantly cast-cross-coupling protectors as a safe means of deploying cable in the well. Other alloys suited for harsh environments are also available. Advanced polymers are offered for low friction and superior impact resistance.

Features and Benefits

- Bolting system locks the protector in place with a close fit over the coupling.
- Bolting or tightening torque resists axial and rotational lateral movement.
- Contoured profile mitigates the potential for impact while running or pulling the completion string by deflecting the cable away from damaged casing and production string hang-ups.
- Angled or chambered profile protects the bolting mechanism against running hang-ups.

ForeSite® Sense Pods

Cable Protector (continued)

Specifications

General	Wiper Blade	I-Wire	Cast/Strapped X-Coupling	Stamped X-Coupling	Polymer X-Coupling
Well geometry	Vertical, no deviation, no dogleg	Vertical, no deviation, no dogleg	Any well deviation through horizontal	Any well deviation through horizontal	Any well deviation through horizontal
Applications	Single, 1/4-in., bare line only	Up to 2 1/4-in. lines	For any cable and line combination and encapsulation	Up to five bare lines or three encapsulated cables	For any cable and line combination and encapsulation
Outer diameter*	2-7/8 to 3-1/2 in. (50.8 to 76.2 mm)	All tubing sizes	All tubing sizes	All tubing sizes	All tubing sizes
Length	15 in. (381 mm)	18 in. (457.2 mm)	Varies upon design criteria	Varies upon design criteria	Varies upon design criteria
Make-up	Pneumatic or manual with 3/4-in. banding	Pneumatic or manual with 3/4-in. banding	30-ft/lb (40.7-N•m) captive bolts	Pneumatic or manual with hinged tapered pin	30-ft/lb (40.7-N•m) captive bolts
Casing size	5 to 6-5/8 in. (127 to 168.3 mm)	4-1/2 to 6-5/8 in. (114.3 to 168.3 mm)	5-1/2 to 9-5/8 in. (139.7 to 244.5 mm)	5-1/2 to 9-5/8 in. (139.7 to 244.5 mm)	5-1/2 to 9-5/8 in. (139.7 to 244.5 mm)
Casing weight	20.3 to 50.4 lb (9.2 to 22.9 kg)	18.8 to 20 lb (8.5 to 9.1 kg)	User specified	User specified	User specified
Special protector**	N/A	N/A	Available	Available	Available

* Protector clearance with tubing and casing combinations are verified for each completion
** SSSV, SSAV, GLM, injection valve, ICD/ICV, and X-overs
Note: Selection criteria and final cable protector programmed are project specific. Torque and drag, and tubing stress-analysis tools, will support the final choice.

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Tubing Hanger Termination Kit: Bend Restrictor for Tubing Encapsulating Cable (TEC)

The ForeSite Sense bend restrictor for 1/4-in. downhole instrument cables prevents cable damage at high stress points at the top of the tubing hanger. The tubing bend restrictor is placed at the fitting on top of the hanger to prevent the cable from breaking at the fitting and to prevent the minimum bending radius of the cable from being exceeded.

The 1/4-in. TEC is typically fed through the tubing hanger on dry trees. The TEC is normally sealed off with one or two metal-to-metal seal fittings, with one on top and one on the bottom of the tubing hanger. Further, the cables are normally wrapped once or twice around the neck of the tubing hanger before landing the hanger. During the landing process, pinching or breaking of the Instrument TEC cable can occur. The bend restrictor reduces the probability of cable damage.

Features and Benefits

- Sizes available for 1/8-, 1/4-, 3/8-, and 1/2-in. tubing fittings; adapters for other sizes or configurations are available upon request.

Tubing Hanger Termination Kit: Tubing Hanger Feed-Through Fitting

The tubing hanger feed-through fitting provides a pressure barrier at the point of entry between the tubing hanger and the cable. TEC downhole Instrument cables are typically fed through the tubing hanger on dry trees and are sealed off with one or two metal-to-metal seal fittings.

Features and Benefits

- Metal fitting alloys are available in either Inconel or stainless steel.
- Fitting configuration uses common rear and front ferrule metal seals.

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Electrical Wellhead Outlet

The ForeSite Sense electrical wellhead outlet (eWHO) accommodates cable feed-through and exit of TEC electric downhole cable from a wellhead. A metal-to-metal primary pressure seal on the TEC armor and the bore of the wellhead penetrator provides the primary pressure barrier. The chamber within the eWHO enables interface of the downhole cable with the surface cabling. A bulkhead feed-through provides a secondary pressure barrier.

The eWHO is quick and easy to install and can operate in harsh environments throughout the life of the well. This outlet is designed to API 6A standards, and has been certified as complying with the Essential Health and Safety Requirements of Annex II of ATEX Directive 94/9/EC. It also complies with European Community standards EN 60079-0: 2012 and EN 60079-1: 2007.

Features and Benefits

- Wellhead flange adaptors comply with specific wellheads
- Metal-to-metal seals provide system integrity for low and high-pressure applications.
- Design conforms to client requirements regarding port size, materials, pressure/ temperature ratings, and well conditions.

Specifications

Working pressure	10,000 psi (689.5 bar)	15,000 psi (1,034 bar)
Wellhead connection thread	1/2 in. NPT male	
Intermediate body connection thread	1 in. AE	
Electrical exit connecting thread	1/2 in. NPT male	9/16 in. NPT male
Component material (standard)	400 series stainless steel (13 Cr)	
Component material (options)	HP yield alloys	
Overall length	11.5 in. (29.21cm)	18.83 in. (47.82 cm)
Certifications	CML 15 ATEX 1181 Ex d IIB T4 Gb IP66 ATEX/QPS, Zone 1	

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Electrical Surface Instrument Cable

The ForeSite Sense electrical surface instrumentation cable provides electrical power connection and signal communication from the wellhead outlet to the surface instrument system. This Gardex® FieldBus cable is a 600 volt, 18 AWG shielded twisted pair instrumentation cable with XLPE insulation. It is approved for Class I, Zone 1 locations.

Gardex FieldBus cable is flexible, with impervious armor that prevents the entrance of water, gas and corrosive elements into the electrical core. It may be installed in tray, duct, conduit, self-supported or direct burial applications.

Features and Benefits

- Completely self-contained fieldbus communication cable is suitable for use in harsh environments.

Specifications

General

Wire size (AWG)	18 AWG
Number of pairs	1 (multi-pair available)
Inner jacket thickness	0.04 in. (1.02 mm)
Armor thickness	0.025 in. (0.64 mm)
Armor diameter	0.54 in.(13.7 mm)
Outer jacket thickness	0.05 in. (1.27 mm)
Nominal overall diameter	0.65 in. (16.51 mm)
Approximate net weight	182 lb per 1,000 ft (597 kg per 1,000 m)
Temperature rating	-94 to 194°F (-70 to 90°C)
Insulation	Passes ASTM D 746-04 brittleness temperature impact test at -103°F (-75°C) Passes MIL-C-13777 cold bend test at -85°F (-65°C)
UL listed	NEC Type MC, UL 1569 NEC Type MC-HL, UL 2225
UL approved and marked	FT-4 designation (flame test) -40°F (-40°C) meeting cold impact requirement of CSAC22.2 No. 0.3

Construction

Conductor	18 AWG, 7 strand annealed tin copper, Class B strand per ASTM B-8 and B-33
Insulation	Cross-linked polyethylene (XLPE)
Shielded pair	Twisted with tin copper drain wire and aluminum foil shield
Shielded pair jacket	Flame-retardant black ARCTIC Grade PVC
PVC armor	Continuously welded and corrugated aluminum

Electrical

Impedance	100 ohms
Mutual capacitance,	17 pf per ft (55.8 pf per m)
Inductance	0.17 µH/ft (.56 µH/m)
Conductor resistance at 68°F (20°C)	7.34 ohms per 1,000 ft (24.1 ohms per 1,000 m)

Gardex is a registered trademark of Rockbestos-Suprenant Cable Corporation.

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Electronic Gauge Surface Data Acquisition System

The ForeSite Sense electronic gauge surface data acquisition system monitors and collects data from one pressure/temperature gauge. A compact, standalone, powder-coated steel enclosure with an external visor provides a liquid crystal or vacuum fluorescent display (VFD) for on-site data output. The unit has a driveby front panel LED indicator to relay the system status and can operate in extreme weather conditions of –40 to 140°F (–40 to 60°C) on a 24 VDC input with a low current draw. The Class 1-, Zone 2-certified system is capable of high-speed data transfer, storing up to 2,000,000 data records locally, and can 'smart' log any input parameter to record transients. The system can be configured to log at any user-defined rate and comes standard with digital and analog inputs and outputs to meet a wide range of field applications.

Features and Benefits

- Weatherford Configuration Manager (WCM) enables all output options and setup configurations to be performed remotely via TCP/IP or on-site
- Automatic control logic (ACL) offers maximum flexibility and structured text programming.
- High-density data enables detailed analysis of any production anomalies.
- Rugged design withstands harsh environments including desert, swamp, platform and extremely low temperatures
- Power source flexibility enables the unit to run on solar arrays or thermoelectric generators

Specifications

Environmental

Operating temperature	–40 to 140°F (–40° to 60°C) with VFD, safe area –4 to 140°F (–20 to 60°C) with LCD, ATEX Class 1 Zone 2
Storage temperature	-76 to 185°F (-60 to 85°C)
Humidity	0 to 95% noncondensing
Certifications	ATEX Class I Zone 2, Ex II 3 G, Ex nA II T5 Gc (-4 to 140°F (-20 to 60°C))

Communications

Serial	Port 1 to 3–RS232/485, full control, configurable
USB	Currently not available
WiFi	802.11
Ethernet	10BaseT

Power Requirements

Input	10- to 32-VDC, <8 W

ForeSite® Sense Pods

Electronic Gauge Surface Data Acquisition System (continued)

Specifications (continued)

Inputs/outputs (standard configuration)

Analog outputs (AO)	Two each, isolated, configurable for content selection (pressure, temperature, AI1, AI2 plus full unit selection)
Analog inputs (AI)	Two each, configurable 0 to 5 V, 4 to 20 mA, 1 to 10 V
Digital outputs (DO)	Two each
Digital inputs (DI)	Two each

Physical (standard)

Dimensions	8.5-in. W x 7.75-in. D x 14-in. H (21.59-cm W x 19.68-cm D x 35.56-cm H)
Weight	15.0 lb (6.8 kg)

Handling

Vibration	Telecordia GF-63-CORE, Sine NAVMAT P-9492, random
Drop	Telecordia GR-63-CORE

Functional

Data logging	2,000,000 data records (user-selectable content for any input) Smart-logging configurable
Data logging rate	1 second to 1 hour, in 1 second increments
Event logging	System events logging (warnings/errors)
Audit logging	System audit logging (parameter changes, power up/down time)
Pressure units	Gauge or absolute: atm, bar, kPa, MPa, psi
Temperature units	°C, °F, °K
Display type (°F, °C)	Vacuum fluorescent, –40 to 140°F (–40 to 60°C) Liquid crystal, –4 to 140°F (–20 to 60°C)
Wire terminations	Fused-type
Processor	ColdFire® VelOSity™/RTOS
Configuration interface	Windows
Visual operating indicator	Bicolor LED

ForeSite® Sense Pods

Wellsite Management System

The ForeSite Sense wellsite management system logs and monitors downhole pressure and temperature signals, and interfaces those signals with artificial-lift controllers to enhance the operation of the system. This system helps operators to optimize production-control assets and artificial-lift equipment to compensate for ever-changing well conditions. Built-in applications minimize reconfiguration requirements, primarily for multiple-well configurations when used in conjunction with ForeSite Pods devices.

The system can also be commissioned stand-alone to support one or multiple wells. The ability to log additional input variables of the system (20 channels capable of 8,400 logging records per channel) is available. Field-equipment data monitoring, logging, and reporting is provided in real time. Connectivity to client-host systems for supervisory control and data acquisition (SCADA) interface is standard.

Features and Benefits

- Modular and scalable distributed control system adapts to varying applications for increased efficiency
- Built-in gas flow, data logging, proportional integral derivative (PID) loops, and accumulator applications provide multifunction capabilities for efficient operation
- Modbus®-compatible host enables open-type architecture to standard automation systems for comprehensive connectivity and remote monitoring of individual and grouped wells
- Modular I/O expansion capability enables monitoring of additional sensors, field equipment, signals

Specifications

Environmental

Operating temperature	-4°F to 149°F (-20°C to 65°C)
Storage temperature	-40°F to 185°F (-40°C to 85°C)
Humidity	0 to 95%, noncondensing

Communications

Serial	Port 1	RS232/485 with RTS and CTS remote
	Port 2	RS232/485 with RTS and CTS
	Port 3	RS232 full control
	Port 4	RS232 full control, no 485 support
Ethernet		10baseT

Inputs/Outputs

Standard configuration	Analog output	8 each, 4 to 20 mA
		6 each, 0 to 5 V
	Analog input	10 each, 4 to 20 mA

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Wellsite Management System (continued)

Specifications (continued)

Functional

Logging	20 channels of 8,400 records each
Display	Vacuum fluorescent
Wire terminations	Fused-latch type
Processor	Phoebus™ module
Configuration interface	Windows® operating system

Physical Dimensions

Width	24 in. (60.96 cm)
Height	30 in. (76.2 cm)
Depth	10 in. (25.4 cm)
Weight (standard)	70 lb (31.75 kg)

Power Requirements

Input (standard)	85 to 260 Vac; 35 watts + (1.66 Watt × no. of mPOD2 gauges) + (0.5 × no. of AOs)
Input (optional)	24 Vdc; 20 watts + (1.25 × no. of mPOD2 gauges) + (0.5 × no. of AOs)

ForeSite® Sense Pods

Data Acquisition Module

The ForeSite Sense data acquisition module is a cased circuit-board assembly that integrates into larger systems such as VFDs or complete Pods data acquisition systems with enclosures. The data acquisition module is configured through Ethernet using an HTTP web interface. It provides power and reads raw data from a single Pods gauge and processes it in the following ways:

- Calculates P/T data based on raw data and a user-supplied gauge calibration file.
- Serves data to external SCADA systems using MODBUS® protocol via Ethernet (MODBUSTCP) and serial RS485/422 (MODBUS RTU).
- Logs data locally on a 32 GB SD card.
- Provides pressure and temperature data through two galvanically isolated analog outputs; current loop 4 to 20 mA.

Features and Benefits

- Multiple communication interfaces simplify integration into data systems.
- Pressure and temperature readings can be configured in standard engineering units for easy interpretation of the data.
- Integrated protective measures mitigate damage or undesirable operation caused by unexpected EM events to reduce the risk of failure and loss of data.

Specifications

Environmental

Temperature Rating	40 to 158°F (-40 to 70°C)

Power Requirements

Electrical rating	15 to 32 VDC input voltage 150 mA actual input current at 24 V Power supply must be able to provide at least 200mA

Physical Properties

Dimensions (W×L×H)	6.87 x 5.17 x 1.88 in. (175 x 131 x 48 mm)
Weight	1.5 lb (680 g)

Communications

Serial	1 Isolated RS485, 1 Unisolated RS422/RS485; MODBUS RTU. Software-configurable terminations
Ethernet	Ethernet over twisted pair (10BaseT, 100BaseTX). Used for HTTP web interface and MODBUS TCP

Logging Capabilities

Update rates	1 second
Data storage (SD card)*	8 years

*Data storage for 32 GB card at 1 s log rate logging pressure and temperature only

ForeSite® Sense Pods

Data Acquisition Module (continued)

Specifications (continued)

Inputs/Outputs: Standard Configuration

AO	Two, galvanically isolated to 1,500 V. Current loop 4 to 20 mA. One for pressure, one for temperature. Scale configurable.
	The AOs require external loop power, nominally 24 V. They will work with 10 to 32 V, making it possible to use the power input for loop power if the AI device on the other side supports this.

Gauge Properties

Maximum number of gauges	1 Pod
Gauge excitation voltage range	15 VDC
Maximum gauge current	11 mA

Firmware Updates

Update mode	Via Web interface

ForeSite® Sense Pods

Mechanical Splice

The ForeSite Sense mechanical splice facilitates connectivity of downhole cables. The mechanical splice is a simple cable-to-cable connection system that has pressure testable seals. This mechanical splice system can be configured to work with either electrical or optical downhole cable designs. The V0-rated, TR2385-qualified design meets the industry's highest standards.

Features and Benefits

- V0 rated sealing technology withstands extreme environment applications.
- TR2385 qualified to 392°F (200°C) and 20,000 psi (1,379 bar) for reliable life-of-well applications.
- Electrical or optical cable compatibility.

Specifications

Operational Performance

Service temperature	-13 to 392°F (-25 to 200°C)
Service pressure	20Kpsi (1,379 bar)
Maximum tension	500 lbs (2,224 N)
Minimum storage temperature	-49°F (-45°C)
Electrical rating	1,000 volts

Material

Wetted	Nickel base alloys (Inconel® 120Ksi)

Seals

Cable	Dual compression set, metal-metal, pressure testable

Mechanical

Weight (single connector)	0.5 lb (0.227kg)
Outside diameter	0.875 in. (22.2 mm)
Make-up length (single connector)	8.376 in. (212.75 mm)