

STATE-OF-THE-ART TURN-KEY FIBER OPTIC SENSING SOLUTION FOR HIGH TEMPERATURE WELLS, UNCONVENTIONAL WELLS AND INTELLIGENT WELLS

KEY FEATURES

Fiber optic downhole P/T sensor

- High operating temperature (+300 °C)
- Optimized for hydrogen rich environment
- Excellent accuracy and long term stability
- Single and multi-point sensing designs
- Safe with no downhole electrical signals
- Fully Immune to EMI, RFI and MRI

Optical Surface Readout Unit

- 2, 4 and 8 measurement channels
- 20 Hz sampling rate
- Low power consumption (<2.5W)
- Low input power (9-24V DC)
- High linearity and excellent precision
- RS-232, RS-485 outputs
- Robust, qualified in extreme surface temperatures (-40 °C to +60 °C)

Fiber optic downhole cable

- Multi-Fiber fusion splicing capability withstanding high temperatures (325 °C)
- Robust SS-316L or Incoloy-825 fiber protection metal tubes

Field installation service

- Full design and field deployment service
- Various deployment methods: coiled tubing, production tubing and casing conveyed.
- High level technical and field support

FIBER OPTIC PRESSURE AND TEMPERATURE SENSORS FOR OIL AND GAS APPLICATIONS



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OPSENS FIBER OPTIC P/T SENSING SOLUTION

Opsens all-sapphire fiber optic pressure and temperature sensor operates under extreme downhole conditions. It delivers in-situ real-time monitoring of downhole pressure and temperature (up to 300°C) in hydrogen and steam rich environments. It can operate at temperature as high as 300 °C (572 °F).

Applications

Thermal Recovery Processes

Opsens sensing system is the ideal solution for monitoring bottomhole pressure and temperature in thermal recovery applications such as steam assisted gravity drainage (SAGD) or cyclic steam stimulation (CSS). The sensors can be deployed on coiled or production tubing in production and injection wells allowing accurate real-time measurements for reservoir surveillance, process optimization or pump control. Fiber optic based pressure and temperature measurements

make the Opsens sensing system an ideal solution for monitoring high temperatures ESP applications or progressive cavity pumps.

Unconventional and Intelligent Wells

Opsens P/T Sensing system can also be used in unconventional wells and intelligent wells. The sensors can be deployed for permanent monitoring and during well interventions.

Opsens offers an outstanding turn-key sensing solution with the OPP-W fiber optic P/T sensor, the WFC multi-fiber cable, the Wellsens multi-channel surface readout unit and a full installation and field support service.

Benefits & Added Value

In-situ and continuous monitoring of the pressure along the producing well helps operators better understand the reservoir condition, rapidly detect steam breakthrough and efficiently diagnose changes in the reservoir. Such optimization of the production process enhances the oil recovery rate and reduces the operating costs associated with steam injection and oil recovery.

Opsens sensing solution is offered in both single and multiple-point configurations. Hence, it gives the operators a large choice of P/T real-time monitoring from monitoring downhole pumps to profiling a producing well.

WellSens Surface Readout Unit

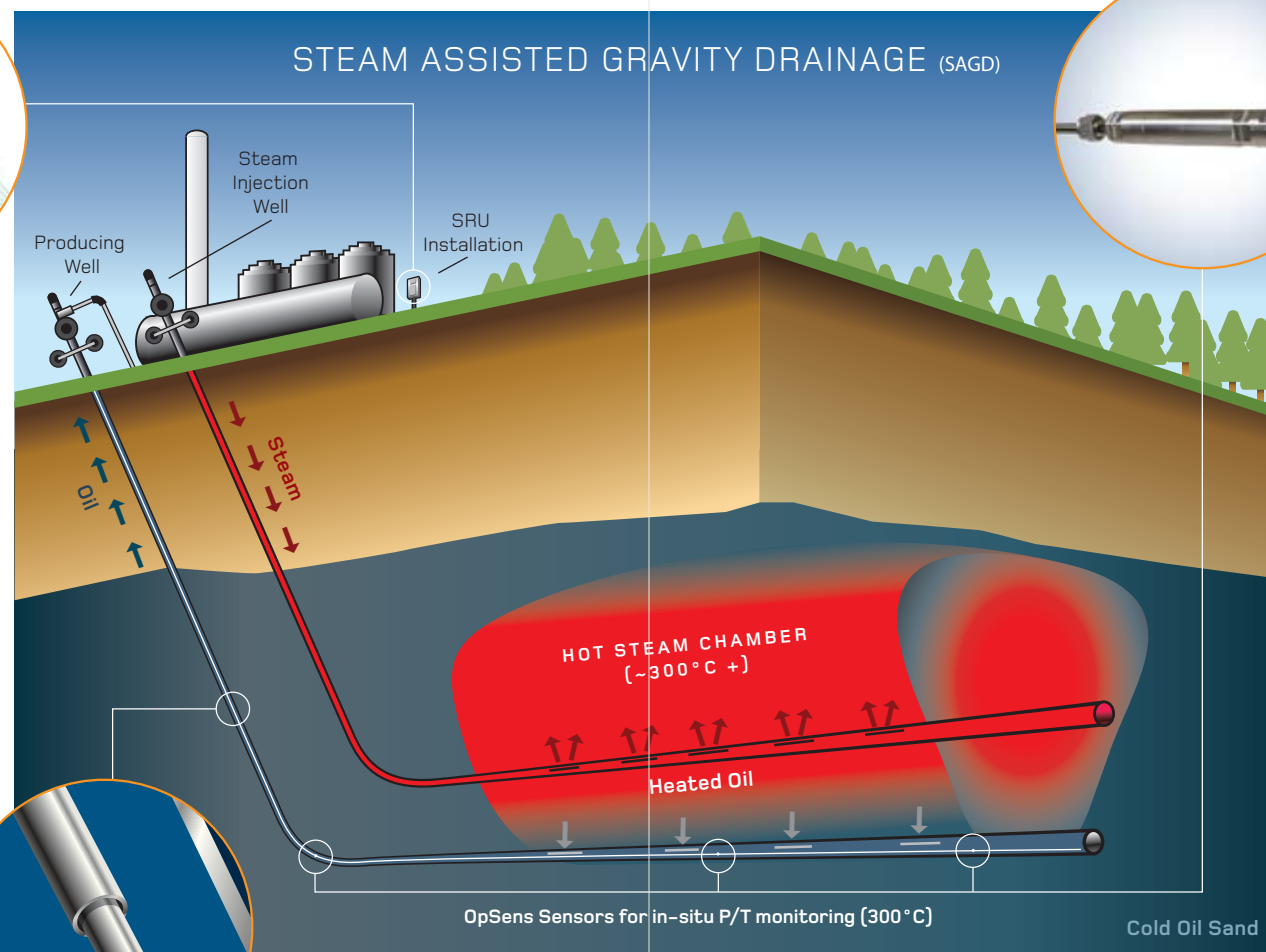


The WellSens is a robust and reliable multi-channel signal conditioner. It is compatible with Opsens' OPP-W sensor. It can operate in extreme surface operating temperature from -40 to +60°C. Its advanced performances, small footprint, low power consumption and ease of use make it the solution of choice for oil fields applications.

At the core of the WellSens is the Opsens' White Light Polarization Interferometry (WLPI) proprietary technology (US patent 7,259,862. Patents pending in other countries). This technology provides a means for making accurate and absolute measurements of the path length difference, which varies as a function of the parameters of interest (pressure or temperature), of any type of interferometric fiber optic sensors. The WellSens is offered with RS-232 and RS-485 serial interface outputs. It provides readings up to 8 measurement channels with a ±0.01% full scale precision. For more information, see WellSens datasheet.

WELLSENS SPECIFICATIONS*

Number of channels	2, 4 and 8
Sensors compatibility	OPP-W P/T sensor
Sampling rate	20 Hz standard
Channel scanning rate	6.67 Hz maximum
Output interface	RS-232, RS-485
Communication protocols	(SCPI and ModBus protocols)
Input power	.9 to 24 VDC
Consumption	2.5 Watt typical
Storage temperature	-40°C to 70°C
Operating temperature	-40°C to 60°C
Humidity	95% non condensing



WFC Fiber Cable

The WFC is a rugged heavy duty fiber cable with up to 8 optical fibers in a protective Stainless Steel 316L or Incoloy 825 multi-tube metal structure.

Opsens proprietary fiber cable design gives the WFC outstanding performances in extreme harsh conditions such as hydrogen and steam rich downhole environments.

WFC FIBER CABLE SPECIFICATIONS*

Fiber count	2 to 8 Optical fibers
Fiber protection	Stainless Steel 316L or Incoloy 825 multi-tube structure
Cable termination	HP/HT connectors
Field fusion splicing	High Temperature resistant (325°C)
Cable length	Up to 3 km continuous length <i>Longer cable available on request</i>

OPP-W Fiber Optic P/T Sensor



The OPP-W is a Fabry-Perot interferometer-based, fiber optic pressure and temperature sensor. The combination of its core highly durable sapphire cell and its rugged Inconel 718 housing makes it the sensor of choice for harsh oil & gas downhole environments such as SAGD, CSS and HT wells.

The OPP-W delivers long term accuracy, durability, low drift and high fidelity pressure and temperature measurements. It offers real time downhole monitoring over long periods of the oil wells' lifetime. The OPP-W sensor is used in conjunction with Opsens' WFC Fiber cable and Opsens' WellSens signal conditioner surface unit. For more information, see OPP-W datasheet.

OPP-W SPECIFICATIONS*

Pressure	
Range (absolute)	0 - 5000 kPa (0 - 750 psi) Higher ranges available on request
Accuracy	± 0.2% F.S.
Resolution	0.01% F.S.
Long term stability	± 0.5% F.S. (Per annum at standard reference condition)
Proof Pressure	200% F.S.
Diaphragm material	Monocrystalline sapphire
Temperature	
Range	-40°C to 300°C
Accuracy	± 1.5°C
Resolution	0.1°C
Package	
Housing material	Inconel 718
Dimensions	19 mm OD, 120 mm length
Operating environment	
Temperature	-40°C to 300°C
Hydrogen and steam	Fully resistant
EM/RF/MR/MW	Fully immune

* All specifications are subject to change without prior notification