

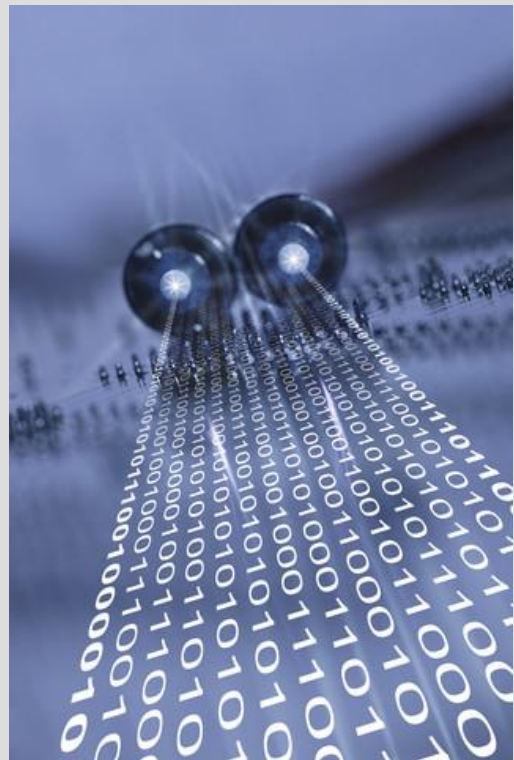


Product
Bulletin

Fibre Optic Distributed Temperature and Acoustic Sensor

Integrated Thermal/Acoustic
Distributed Sensing System
for Downhole Applications

Preliminary Release



QOREX is pleased to offer integrated distributed temperature & acoustic sensor (DTAS) systems built upon a platform of commercially available Raman (DTS) and Coherent Rayleigh distributed acoustic instruments, optical sensing cables, and components. DTS technology provides accurate temperature measurement every meter or so along a passive optical sensing fiber up to several kilometers in length. Raman DTS technology is relatively mature and the most prevalent fibre optic sensor technology in upstream oil & gas by virtue of its simplicity and unique functionality of real-time, full wellbore measurement over conventional logging tools. The acoustic analog of DTS, distributed acoustic sensors detect acoustic or vibrational events acting along a sensing fibre, offering operators the ability at surface to “listen” to events happening in the well.



Among distributed acoustic sensing technologies, Coherent Raleigh optical time delay reflectometry (COTDR) has emerged as one of the more promising and commercially viable approaches over others that are more complicated and expensive to implement. Like conventional OTDR used throughout the optical telecoms industry, COTDR leverages Rayleigh scatter effects and is built upon the same basic optoelectronic platform, but uses a higher coherence laser and optical phase demodulation processor to detect vibration or acoustic energy acting on the fibre. Acoustic interaction causes slight longitudinal micro-strain on the fibre, changing slightly the distance between Rayleigh scatter sites. Exciting the fiber with pulses of high coherence laser light will cause optical interference between scattered light of different sites within the length of the pulse. By applying phase demodulation of backscattered signal at a particular delay time, it is possible to recover this strain information and characterize acoustic and vibrational disturbances and events acting at any discrete point along the fibre.

QOREX has worked with the leader in optical phase detection and acoustic sensor interrogation technology to develop a COTDR instrument suitable for practical deployment in oil and gas application environments. QOREX has integrated the COTDR with its high temperature DTS platform to offer an introductory integrated DTAS system. Correlating synchronous thermal and acoustic data holds the potential for new possibilities in monitoring flow, and identifying areas of phase changes and inflows to provide greater insight into reservoir response to well operations and treatments. As a technology leader in upstream fibre optics, QOREX has been at the forefront of resolving high temperature effects on downhole fibre optic systems in the thermal recovery sector. The new prototype DTAS system is being offered to the same standards of quality, performance and durability customers have come to rely upon.

Preliminary Distributed Thermal/ Acoustic Sensing System

- Real-Time, Full Wellbore Monitoring
- Passive Downhole Sensor Fibre
- Single Surface Data Acquisition Module; Correlated Thermal Acoustic Data
- Operating Simplicity & Deployment Flexibility
- Built on Proven Fibre Optic Platform

Integrated DTS + Acoustic Opens New Possibilities For Monitoring Flow, Phase Changes, and Locating Areas of Inflow



System Specification

Thermal	
Measurement Distance	5km
Temperature Accuracy	0.8°C
Temperature Resolution	0.1°C
Nominal Update Rate	20-Minutes
Temperature Measurement Range	0-300°C
Minimum Spatial Resolution	1.0m
Acoustic	
Measurement Distance	2km
Minimum Spatial Resolution	5.0m
Nominal Update Rate	1Hz
Frequency Response	20Hz-10KHz
Operating Temperature	0-300°C
Surface Cabinet	
Instrument Operating Temperature	-10° to 60°C
Instrument Storage Temperature	-40° to 80°C
Maximum Steady State Power Draw	<40W
Data Format	ASCII Time/Position/Temp/Amplitude-Frequency
Data Interface	Ethernet

Configuration

While details of the final configuration and component selection are determined on a project basis, the DTAS system is comprised of a surface data acquisition module (DAQ), surface cabling system, and the downhole sensing cable.

The DAQ unit is delivered fully integrated in a standard 19" sealed equipment rack containing the DTS and COTDR instruments, PC processor and user interface, UPS and wiring harness, and Ethernet connection. A surface cabling system using low temperature outdoor rated cable and interconnect hardware will make the optical connection between the DAQ and sensing cable terminated at the wellhead. Sensing fiber exiting the wellhead is terminated with a pressure seal. One each high temperature hydrogen-tolerant multi-mode and single mode sensing fibre are contained in a standard 1/4" armored downhole cable for installation flexibility using conventional clamped tubing conveyed deployment, coiled tubing or fluid injection, or run-in as braided slickline.

QOREX works directly with client engineering staff to specify final details of DTAS pilot systems most appropriate for the application. Working with subcontractors, we manage the entire process from initial engineering design through installation, commissioning, interface to customer IT systems.

Features

- Reliable, Easy Operation
- Low Maintenance, No Calibration
- Synchronized Thermal and Acoustic Data
- Ruggedized High Temperature Armored Optical Sensing Cable Rated to 300°C
- Operates On Pure Silica Core Fiber for Hydrogen Environments
- Full Sensing Fibre Diagnostics Including Loss Trace
- Optional NEMA 4 Enclosure

About QOREX

The company was formed in 2007 by partners with over 50-years combined fiber optic experience, with focused activity over the past 10-years in oil and gas sensing system design and installation since the technology was first introduced. Since its founding, QOREX has been involved in the successful launch of client oil and gas fiber optic sensing products in the challenging thermal recovery sector. As an independent systems integrator, QOREX selects from among the best commercial components to meet the technical and commercial requirements of each application, and passes these benefits on to customers. The company recently introduced high temperature DTS systems rated to 300°C, that combine proprietary sensing component processing along with QOREX expertise in design and qualification of downhole monitoring systems for the harshest oil & gas and geothermal well environments. QOREX is the first to warranty its products for hydrogen performance in these challenging applications. QOREX engineering and factory operations are housed in a modern purpose-built facility with dedicated system integration and calibration laboratories.

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