

Principle of European Downhole Temperature Measurement Optical Cables



Article Overview

Downhole temperature measurement in Europe using optical cables relies on distributed temperature sensing (DTS) technology, which measures temperature along the length of a fiber-optic cable via Raman backscatter.

Core Principle

European downhole DTS systems use fiber-optic cables installed in boreholes to continuously monitor temperature along their length. A laser pulse is sent through the optical fiber, and the light interacts with the molecular structure of the glass. Some of this light is backscattered, with a portion undergoing Raman scattering, which is sensitive to temperature changes. The system measures the ratio of temperature-dependent anti-Stokes light to temperature-independent Stokes light, allowing precise determination of temperature at each point along the fiber. The location of the temperature measurement is determined by the time delay between the emission of the laser pulse and detection of the backscattered light, following the optical time-domain reflectometry (OTDR) principle .

Measurement Techniques

- Passive DTS: Measures ambient downhole temperatures without altering the environment. It is used to monitor natural thermal gradients, groundwater flow, or seasonal temperature variations

Article Content

Mar 10, 2026

Downhole fiber optic temperature-pressure innovative measuring

In this study, fiber optic Bragg grating (FBG) measurement technology is utilized applied in an attempt to replace more

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Distributed Temperature Sensing as a downhole tool in hydrogeology ...

The principle is that when the cable is heated with a constant power input over time, the temperature inside the cable

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Application of fiber optics in oil and gas field development ...

The application of optical fiber aids data quantification, which facilitates the real-time monitoring of oil reserves, asset

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The Essentials of Fiber-Optic

The backscattered light returning to the measurement box is analyzed to produce a temperature measurement every meter down the

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Downhole Fiber-Optic Monitoring: An Evolving Technology

Fiber Optics It has been an impressive comeback for a technology that once stood on the brink of failure. The upstream

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An Industry Overview of Downhole Monitoring Using Distributed ...

Distributed Temperature Sensing (DTS) system using optical fiber has been deployed for downhole monitoring over

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Downhole Cables

TEF cable is the sensor element for modern distributed fiber optic sensing technologies of DTS and DAS, which have become

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Hot or not; monitoring subsurface temperatures at the Glasgow

Measurements are taken by sending a laser pulse (i.e. a beam of light) from the DTS interrogator along the fibre-optic

Nov 29, 2025

Fiber Optic Distributed Temperature Sensing | US EPA

Abstract: Raman spectra distributed temperature sensing (DTS) by fiber-optic cables has recently shown considerable

Mar 11, 2026

Downhole Cables

A hybrid cable enables the combination of modern distributed fiber optic sensing well management technologies of DTS and DAS

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Fiber Optic Sensing for Downhole Monitoring in Oil & Gas

Explore how fiber optic sensing is transforming downhole monitoring for

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Principles of Distributed Temperature Sensing

In this document, the principles of DTS will be introduced. DTS have been proven to be the instruments of choice for numerous

Dec 02, 2025

Fiber optics

Our proven fiber optics technologies also support point measurement pressure/temperature gauges to monitor downhole pressure

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MEASURING DOWNHOLE TEMPERATURE BY COMBINING

In particular, this application is directed to precise measurement of temperature in downhole environments utilizing

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Fiber Optics | GEO PSI

By pairing fiber optics with gauge sensing technology, we give you a more complete picture of downhole conditions

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Distributed Temperature Sensing as a downhole

The principle is that when the cable is heated with a constant power input over time, the temperature inside the cable at steady state

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Borehole Optical Fibre Distributed Temperature Sensing vs ...

This expertise helps to locate and monitor geothermal installations as well as observe diverse aspects of natural and

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Hot or not; monitoring subsurface temperatures at the Glasgow

The Glasgow Observatory has fibre-optic distributed temperature sensing (FO-DTS) cables installed in the five mine

Aug 25, 2025

Fiber Optic Distributed Temperature Sensing | US EPA

Abstract: Distributed Temperature Sensing (DTS) technology enables downhole temperature monitoring to study

Nov 16, 2025

Real-time monitoring of pressure and temperature of oil well using a ...

Abstract A carbon-coated and bellow-packaged optical fiber sensor for high pressure and high temperature monitoring

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Real-time fiber-optic interpretation and analysis

real-time fiber-optic interpretation and analysis solutions deliver production intelligence across the full

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Real-Time Downhole Monitoring Using DAS and DTS: A New

Distributed Acoustic Sensing (DAS) and Distributed Temperature Sensing (DTS) measurements are technologies

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FIBER OPTICS: Downhole Fiber-Optic Monitoring: An Evolving Technology

FIBER OPTICS: Downhole Fiber-Optic Monitoring: An Evolving Technology It has been an impressive comeback for a

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New methods in geophysical exploration and monitoring with DTS and

Apart from boreholes, fiber-optic sensing also opens up new possibilities for geophysical measurements at surface, especially since

Nov 13, 2025

Fiber optic pressure and temperature sensor for observation well and ...

Temperature monitoring Robust fiber optic temperature sensor packaged for the most demanding environment. Permanent exposure

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