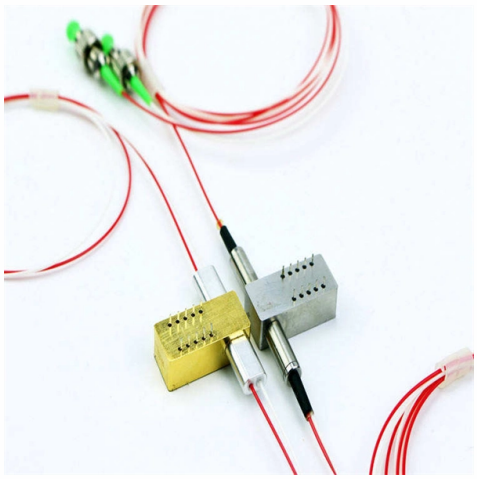
Technical Requirements for Well Logging Optical Cables



Overview

Permanent fiber-optic cable Permanent downhole fiber-optic cables are critical infrastructure in wellbore monitoring systems, ensuring reliable transmissio.

Key Takeaways

Well logging optical cables must meet stringent mechanical, thermal, and chemical standards to ensure reliable data transmission in harsh downhole environments.

Cable Construction and Fiber Protection

Well logging optical cables are typically designed with fiber-in-metal tubes (FIMTs), where optical fibers are hermetically sealed within stainless steel or INCONEL® tubes to provide crush resistance, corrosion protection, and strain minimization. Filling gels or solid foamed thermoplastic elastomers are used to prevent microbending and chemical ingress, while outer polymer layers or armor provide mechanical buffering and centralization. Wire-armored or corrugated steel layers enhance tensile strength and handling during deployment.

Fiber Types and Sensing Capabilities

Cables can include single-mode and multimode fibers to support distributed sensing applications such as distributed temperature sensing (DTS), distributed acoustic sensing (DAS), and distributed strain sensing (DSS). Fibers may also interface with point sensors like fiber Bragg gratings (FBGs) or pressure sensors for localized measurements. The fiber selection and configuration are tailored to the specific monitoring and telemetry requirements of the well.

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Mechanical and Thermal Requirements

Optical cables must withstand high tension from tool weight and well depth, elevated temperatures, high pressures, and exposure to corrosive well fluids. Controlled prestressing during fabrication ensures fibers remain strain-free, minimizing optical degradation or breakage. Cable jackets, fillers, and insulation are selected to maintain mechanical integrity and thermal stability over the operational life of the well.

Deployment and Operational Standards

Cables are designed for repeated deployment in vertical, deviated, or high-temperature wells, supporting continuous data transmission for formation evaluation, well integrity, and production monitoring. Permanent installations may be cemented behind casing or strapped to production tubing, while logging cables are often deployed via wireline or slickline. High-temperature-resistant designs replace traditional water-blocking gels with solid foamed elastomers to maintain performance under extreme conditions.

Data Transmission and Reliability

Standards emphasize low optical loss, stable impedance, and minimal noise to ensure accurate real-time data acquisition. Distributed fiber-optic sensing allows the cable itself to act as a sensor, providing continuous coverage along the wellbore and enabling rapid detection of anomalies such as tubing-to-annulus communication or flow irregularities. This approach significantly reduces diagnostic time compared to traditional single-point measurements.

Customization and Compliance

Cables are customizable in terms of fiber count, type, armor, encapsulation, and filler materials to meet specific well conditions and operational requirements. Compliance with industry standards for mechanical strength, thermal resistance, chemical compatibility, and optical performance is critical to ensure long-term reliability and safety in oil, gas, and high-temperature mining applications. In summary, well logging optical cables are engineered to combine robust mechanical design, high-temperature tolerance, chemical resistance, and precise optical performance, enabling reliable, real-time monitoring and data acquisition in the most demanding downhole environments.

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Article Content

Permanent fiber-optic cable

Permanent downhole fiber-optic cables are critical infrastructure in wellbore monitoring systems, ensuring reliable transmission of data for applications such as distributed temperature, acoustic, and

Optical fiber logging cable Special cable

Optical fiber logging cables are also designed to withstand high temperatures and pressures, making them suitable for use in deep and high

The High-temperature Resistant Well Logging Optical Cable

The cable range for direct buried installation includes all four of our basic designs: concentric core, slotted core tape, DryTech and loose tube tape. The cables are reinforced with corrugated steel tape,

FOA Standard For Installing Fiber Optic Cable Plants

Although most fiber optic cables are not conductive, any metallic hardware used in fiber optic cabling systems (such as splice closures, pedestals, messenger wire, wall-mounted termination boxes,

Downhole Fiber Optic Cable | Fibercore

Fibercore offers a range of designs for downhole fiber optic cable to meet the specific requirements of your oil or gas well. These types of cables are permanently installed either cemented in behind the

Fiber Optic Cables | Fibercore

Fiber optics are used for measuring a variety of attributes in an oil or gas well including: distributed temperature, distributed acoustic energy, and strain. This is also used alongside telemetry for fiber

GB2333610A

The Rafie et al ''547 patent discloses a well logging cable having optical fibres which can substitute for one or more of the electrical conductors in a well logging cable to increase...

US6392151B1

In the preferred embodiment, the tube is surrounded by an elastomeric jacket, and is filled with hydraulic oil or the like to prevent entry of wellbore fluids into the tube under hydrostatic...

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Optiq Fiber-Optic Solutions | SLB

For permanent deployment, the hybrid fiber-optic electrical cable of Optiq solutions is installed within the completion string or behind tubing. It can also be installed across the sandface for both wet and dry

SUBSEA FIBER OPTIC SYSTEMS MEET THE CHALLENGES OF

Despite the advantages of fiber optics technology in information-carrying capacity and sensing, adoption has not been as rapid in subsea oil production as in other industries. Optical fibers are seen as

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 location, and temperature. Although conventional methods have

The High-temperature Resistant Well Logging Optical Cable

The High-temperature Resistant Well Logging Optical Cable Suitable for oil wells, gas wells, coal mines or under high temperature conditions. Cables marked with Dry; Are a series of cables in which the

Reducing Intervention in Subsea Wells With Fiber-Optic

Reducing Intervention in Subsea Wells With Fiber-Optic Technology Fiber-optic-system installations have reduced the need for intervention by

Design and Experimental Research of a Fiber-Optic ...

This system provides a way that allows optical information to transmit in a high-temperature environment. It can be applied to well logging and fiber-optic sensing (e.g., real-time

The Optic Oil Field: Deployment and Application of Permanent In-well ...

This paper presents several recent deployments of in-well fiber optic monitoring systems, including descriptions of the downhole sensor assemblies, installations, and measured data.

Permanent fiber-optic cable

How it improves performance Advanced design and construction Permanent downhole fiber-optic cables are critical infrastructure in wellbore monitoring systems, ensuring reliable transmission of data for

Hybrid Electro-Optical Cable for Coiled Tubing Logging and ...

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This new hybrid cable and its associated surface and downhole system provide a single solution for interventions, distributed measurements, and logging. Altogether, they pave the way for

A High Data Rate Fiber Optic Well Logging Cable

This development has led to a new logging cable with superior mechanical properties, containing eight electrical wires and three optical fibers with a data rate of at least 10 Mbitsl second each. This fiber

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