Well Logging Optical Cable Technical Standards



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

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,

Downhole Logging

Whether you are specifying cable for new logging tools, upgrading existing drums, or planning high-temperature runs, our team can help define a wireline design that

Optoelectric permanent downhole cable

The optical fibers operate independently of the electrical conductor and do not affect its reliability. The SLB optoelectric cable is externally identical to a standard permanent downhole cable and no

GB2333610A

A well logging cable 10 includes an optical fibre 2 and a pressure sealed enclosure 26 surrounding the fibre. The enclosure is adapted to be able to be elongated to the maximum expected...

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

This study presents the evolution of downhole fiber optics to a new hybrid electro-optical cable for coiled tubing (CT) applications. The optical fibers enable optical communication and

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

Optical fiber logging cable Special cable

In comparison to traditional wireline cables, optical fiber logging cables are lighter, safer, and less prone to signal interference. Optical fiber cables are typically used for well logging activities

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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...

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

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

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

Distributed Acoustic Sensing Acquired Wellbore Seismic Data Using ...

When optical fibers are part of a hybrid optical-electrical logging cable, seismic data can be acquired during any logging intervention, improving efficiency and data collection. This integration

Design and Experimental Research of a Fiber-Optic Communication

Download Citation | Design and Experimental Research of a Fiber-Optic Communication Module for Well Logging | Fiber-optic transmission has been applied in oil and gas industry over the

Borehole Geophysics | U.S. Geological Survey

Borehole geophysics is the science of recording and analyzing measurements of physical properties made in wells or test holes. Probes that measure different properties are lowered into the

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.

Cable Logging? Optical Fiber Logging?--JASON is ready for you!

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Difference between Optic-Fiber logging and traditional cable logging The electrical-based sensors used in cable logging can not work continuously in harsh downhole environments (high temperature, high

Production logging via coiled tubing fiber optic ...

However, a number of shale gas wells need to be evaluated in the effects of well drilling and completion and fracturing, providing the guidance for the next fracturing design, so the production logging via

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