

Cable Tunnel Temperature Sensing Optical Cable



Overview

Distributed Temperature Sensing (DTS) | AP Sensing Distributed Temperature Sensing (DTS) systems provide temperature information for accurate thermal monito.

Key Takeaways

Fiber optic DTS cables provide continuous, high-resolution temperature monitoring along cable tunnels, enabling early fire detection and thermal management.

Overview of DTS Technology

Distributed Temperature Sensing (DTS) systems use standard optical fibers as linear temperature sensors to monitor temperature along the entire length of a cable, often spanning several kilometers. The technology relies on Raman or Brillouin optical scattering, where a laser pulse is sent through the fiber and the backscattered light is analyzed to determine temperature at specific points along the cable. The position of each temperature reading is calculated using Optical Time Domain Reflectometry (OTDR) or Optical Frequency Domain Reflectometry (OFDR), providing spatial resolution down to 1 meter.

Applications in Cable Tunnels

In cable tunnels, DTS optical cables are used to: Monitor power and communication cables for overheating or fire hazards. Detect hot spots in real time, allowing preventive or corrective actions before damage occurs. Provide continuous coverage along the tunnel, unlike conventional point-based sensors, ensuring no gaps in monitoring.

Operate safely in high electromagnetic fields and hazardous areas, as the system is passive and immune to interference.

Optical Cable Design

Specialized temperature sensing optical cables for tunnels, such as the SCJKBH-T-03L DTS MM cable, feature: Spiral armored tubes for mechanical protection.

Reinforcement with aramid and metal wire weaving. Outer protection with low smoke, halogen-free, flame-retardant materials.

Single-mode or multimode fibers with excellent Raman scattering characteristics for accurate temperature measurement. Compatibility with dedicated DTS equipment for real-time monitoring and system integration.

Advantages of Fiber Optic DTS in Tunnels

Early detection: Identifies temperature rise before reaching critical levels. High

accuracy: Temperature readings within $\pm 1^{\circ}\text{C}$ and hot spot localization within 1 meter.

Low maintenance: Passive fiber with no moving parts, corrosion-free, and long service life.

Scalability: Can monitor long tunnel sections (up to 10 km or more) with thousands of measurement points. Versatility: Suitable for industrial, petrochemical, steel, coal, and large building applications.

Installation Considerations

Cables should be fixed at recommended distances (typically 1.5 meters apart) from the ceiling or cable trays to ensure accurate temperature detection. Pre-alarm levels can be set for individual cable tray risks, allowing customized fire detection thresholds.

The system can be integrated with fire alarm and building management systems for automated response.

Conclusion

Using fiber optic DTS cables in cable tunnels provides a reliable, continuous, and high-resolution method for temperature monitoring and early fire detection. The combination of robust cable design, precise measurement, and real-time monitoring ensures enhanced safety, asset protection, and operational efficiency in critical infrastructure environments.

Article Content

Distributed Temperature Sensing (DTS) | AP Sensing

Distributed Temperature Sensing (DTS) systems provide temperature information for accurate thermal monitoring, fire detection, and condition assessment by

Distributed Temperature Sensing (DTS) | NKT

Unlock maximum performance and early detection of potential issues with our temperature sensing technology. DTS utilizes optical fiber to gauge temperature

Distributed Temperature Sensing Fiber Optic Cable (DTS)

As the distributed temperature sensing fiber optic cable allows temperature measurements to be taken along the entire length of the cable, temperature measurements can also be measured over long

Fibresense

Unlike conventional detection systems that rely on discrete sensing points, fibre optic heat detection continuously monitors temperature along the entire length of

Fiber Optic Sensor Cables for Advanced Monitoring

LHD technology with sensor cables enables precise, real-time monitoring of temperature changes over large areas, making it ideal for tunnels, industrial

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Temperature Sensing in Underground Facilities by Raman-OFDR

High-resolution temperature sensing with Raman-OFDR using optical communication fiber cables shows great potential as it allows the surveillance of several kilometers of underground transport facilities

Setting and laying of temperature sensing optical fibers for tunnel cables

Layout of temperature sensing optical cables in interval tunnels. The heat sources for sensing environmental temperature through temperature sensing optical fibers include radiative heat

Distributed Temperature Sensing (DTS) -

DTS (Distributed Temperature Sensing) measures the temperature along an optical fiber, every meter, over many kilometers. This results in an accurate and continuous temperature profile along the

Distributed temperature sensing

Distributed temperature sensing systems (DTS) are optoelectronic devices which measure temperatures by means of optical fibres functioning as linear sensors. Temperatures are recorded along the optical

Introduction to DTS

Introduction to DTS WHAT IS DTS? Distributed Temperature Sensing (DTS) is a fiber-optic sensing technology for measuring spatially resolved temperature profiles along fiber-optic sensor cables.

Fiber Optic Sensor Cables for Advanced Monitoring | AP Sensing

Fiber optic sensor cables are the key enabler for real-time monitoring of temperature, strain, and acoustic signals across diverse and challenging environments. Depending on the application and the

OPTICAL FIBRE INTELLIGENT LINEAR HEAT DETECTION FOR ROAD AND RAIL TUNNELS

DTS is being used to provide solutions to an increasing number of temperature measurement problems and fire detection, particularly in tunnels, is one such application. This paper describes the

Fiber Optic Linear Heat Detection (LHD) | Raman-OTDR | AP Sensing

Fiber Optic Linear Heat Detection Technology A Linear Heat Detection (LHD) system is designed to monitor and detect changes in temperature along the length of a sensor cable. A fiber optic LHD

Power Cable Monitoring for Overheating

The DTSX distributed optical fiber temperature sensor is a solution for monitoring abnormal cable temperatures and cable tunnel fires. It is a powerful tool for maintenance of critical power

Temperature sensing in underground facilities by Raman optical ...

High-resolution temperature sensing with Raman optical frequency domain reflectometry (OFDR) using optical communication fiber cables shows great potential as it allows the surveillance of several

An IoT-based Temperature Monitoring System for Underground Cable Tunnels

Underground power transmission cables often have to face the challenge of poor ventilation, which decreases power transmission capacity and damages the materials of the cables in a high

Distributed fiber optic sensors for tunnel monitoring

Abstract Distributed fiber optic sensors (DFOSs) possess the capability to measure strain and temperature variations over long distances, demonstrating outstanding potential for monitoring

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