Tunnel Fiber Optic Grating Crack Gauge

Overview

In this paper, we introduce a distributed fiber optic sensing approach for crack monitoring along concrete tunnel linings. The designed setup allows strain measurements with a very high precision of about 1μm/m every 10 millimeters or even better. Structural cracks may develop in the secondary lining due to this stress redistribution and bias pressure, consequently affecting the overall construction safety of the tunnel. This paper aims to achieve real-time monitoring of the excavation stability of the lining structure by integrating two. How HBK's advanced fibre optic sensing technology enabled real-time strain and temperature insights at the Kühtai 2 hydropower station. Fiber Bragg sensors measure physical quantities, such as strain, with light. The earth pressures involved in tunnel lining structural design has been determined based on experience.

Article Content

Nov 10, 2025

Assessment of crack patterns along plain concrete tunnel linings using ...

In this paper, we introduce a distributed fiber optic sensing approach for crack monitoring along concrete tunnel linings. The designed setup allows strain measurements with a very high precision of about

Jun 30, 2025

Damage Detection and Evaluation for an In-Service Shield Tunnel

The neutral axis position and the proposed damage index can be determined using long-gauge Fiber Bragg Grating sensors.

Nov 18, 2025

Monitoring of Tunnel Second Lining and Steel Lining by Using Fiber ...

By converting the strain of gauge rod into the strain of beam, two fiber Bragg gratings are separately mounted on the top and bottom surfaces of beam, and as a result shifts its Bragg

Apr 29, 2026

Development of Fiber Grating Crack Gauge Based on New

In order to monitor the relative displacement of the building structure and the opening and closing degree of the cracks for a long time, a fiber grating crack gauge with a new temperature

Dec 12, 2025

Distributed fiber optic sensors for tunnel monitoring: A state-of-the ...

Addressing the spatial limitation is crucial for the optimization of conventional tunnel monitoring, and the distributed fiber optic sensor (DFOS) offers a competent solution to this challenge.

Jul 24, 2025

Tunnel Monitoring with Fiber Bragg Sensors

Tunnels are at the core of our infrastructure. But how safe are they? Today, modern monitoring systems allow reliable condition monitoring of tunnels using optical sensor technology, based on fiber Bragg

Jul 16, 2025

Design and experiments on a wide range fiber Bragg grating sensor

The tunnel collapse problem of coal mine is very common and its damage is very serious. It also seriously endangers people''s lives and property safety. At present, a variety of instruments are

May 29, 2026

Assessment of Tunnel Lining Stability through Integrated Monitoring of ...

This study integrates structural deformation analysis with fiber Bragg grating strain monitoring to assess tunnel structure stability. ABAQUS simulation (ABAQUS 6.17) is used to analyze the deformation and

Dec 15, 2025

Fiber Bragg grating (FBG)-based sensors: a review of

This review paper aims to give a general understanding of the basic principles of FBG sensors, advances in sensing and data processing techniques,

Jul 19, 2025

Assessment of Tunnel Lining Stability through Integrated Monitoring of ...

To achieve long-term real-time monitoring and a more accurate assessment of the tunnel structure''s stability, the paper introduces fiber Bragg grating (FBG) strain sensor monitoring technology.

Jun 07, 2026

Diagnosis and Monitoring of Tunnel Lining Defects by Using ...

The monitoring results demonstrated that the stress–strain of the second lining fluctuated within a small range, and the lining did not show any crack expansion behavior, which indicated that carbon-fiber

Nov 18, 2025

Assessment of Tunnel Lining Stability through Integrated Monitoring of ...

By analyzing the displacement and deformation of the lining structure, its stability can be preliminarily evaluated in the short term. To achieve long-term real-time monitoring and a more

Jun 12, 2026

Crack monitoring using short-gauged Brillouin fiber optic sensor

This study presents a novel fiber-optic sensor named short-gauged Brillouin fiber optic sensor, which enables basic Brillouin-based analyzers to achieve early crack detection and accurate

Aug 23, 2025

Damage Detection and Evaluation for an In-Service Shield Tunnel

A loading experiment for a scaled-down model of a shield tunnel using long-gauge Fiber Bragg Grating sensors indicated that the errors in the HFM1 were no more than 5.0% in the case of early damage

Mar 31, 2026

Assessment of crack patterns along plain concrete tunnel linings

ABSTRACT: Acquiring the crack patterns along slender unreinforced concrete tunnel final linings, especially behind post installed facings (e.g. fire protection panels), requires extensive manual effort.

Jul 16, 2025

Fiber Bragg Grating Displacement Sensor With High ...

This paper presents a fiber Bragg grating (FBG) displacement sensor for crack monitoring in high-speed railway tunnels. Two FBGs placed in a single-mode optical fiber around two cylindrical

Nov 20, 2025

Fiber Bragg grating sensor fatigue crack real-time monitoring based

As one of the most critical tasks in structural damage monitoring, real-time fatigue crack monitoring plays an important role in improving the durability of a structure. In this paper, an online

Mar 24, 2026

Assessment of Tunnel Lining Stability through Integrated ...

This paper aims to achieve real-time monitoring of the excavation stability of the lining structure by integrating two monitoring technologies: structural deformation monitoring and fiber

Nov 16, 2025

Fiber Bragg grating sensors for monitoring of physical

Fiber Bragg grating technology is popularly used in measurements of various physical parameters, such as pressure, temperature, and strain for civil

Aug 29, 2025

Tunnel Monitoring with Fiber Bragg Sensors

Today, modern monitoring systems allow reliable condition monitoring of tunnels using fiber Bragg technology. Mechanical deformations in a tunnel can present a significant safety hazard, particularly

Aug 30, 2025

High-sensitivity water leakage detection and localization in tunnels ...

This paper presents a novel super absorbent polymer (SAP)-coated ultra-weak fiber Bragg grating (UWFBG) strain sensing cable for enhanced water leakage detection and localization in

Mar 07, 2026

Method for determination of crack bridging parameters using long ...

This paper demonstrates that by embedding a long optical fiber Bragg grating into a reinforcing fiber and using an established model of the grating response to non-uniform stress

Oct 01, 2025

Fiber Bragg Grating Strain Gauge Structural Monitoring for Tunnel ...

YTFB01 Fiber Bragg Grating Strain Gauge is a high-precision measurement device integrating advanced fiber Bragg grating technology. It requires no power supply, is immune to electromagnetic

Dec 01, 2025

Fiber Bragg Grating Sensors-Based In Situ Monitoring

Abstract Compared with electrical strain gauges, fiber Bragg grating (FBG) sensing technology is a relatively novel method for tunnel structural health

Mar 24, 2026

Full-Length Tunnel Structural Monitoring

Additionally, tunnels are often difficult to inspect since the access is restricted due to operational reasons. If such structural risks have been recognized in the design phase or have been identified by

Aug 27, 2025

(PDF) Application of Fiber Bragg Gratings for Measuring

Abstract The use of fiber Bragg gratings in the device for measuring the rate of crack opening in various materials under mechanical load is considered.

Feb 14, 2026

Field Monitoring of Shield Tunnel Lining Using Optical Fiber Bragg ...

The authors developed techniques to attach optical fiber Bragg gratings (FBG) in the reinforcement as a means to monitor the strains experienced by the shield tunnel lining. Readings were recorded from

Contact Us

For more information, pricing, or custom solutions, please contact us:

Website: https://www.moletenare-ew.co.za
Email: info@moletenare-ew.co.za
Phone: +86 138 1658 3346
Address: Ningbo, China

This document is for informational purposes only. Specifications subject to change without notice.