

Displacement Fiber Optic Sensor Principle and Price



Overview

Review of Fiber Optic Displacement Sensors This article reviews specifically the advanced fiber optic displacement sensing techniques that have been develo.

Key Takeaways

Fiber optic displacement sensors measure the distance to a target by detecting changes in light intensity or phase reflected from the target, offering high-precision, non-contact displacement measurement. Working Principle

Fiber optic displacement sensors (FODS) operate by modulating light properties—primarily intensity or phase—based on the distance between the sensor probe and the target surface . The core components include:

- Light Source: Typically an LED for cost-effective solutions or a laser diode for higher precision .
- Optical Fibers: Transmit light to the target and collect reflected light. Configurations include bifurcated bundles or single fibers with beam splitters .
- Photodetector: Converts the returned optical signal into an electrical signal proportional to the reflected light intensity .
- Signal Processing Electronics: Amplifies and interprets the photodetector signal to determine displacement .

Extrinsic (Intensity-Modulated) Sensors

In extrinsic FODS, light is sent through a transmitting fiber to a moving target. The reflected light is captured by receiving fibers and measured by a detector. The displacement is inferred from changes in reflected light intensity: if intensity increases, the target moves closer; if it decreases, the target moves away . This method is simple, robust, and suitable for harsh environments.

Interferometric Sensors

Some high-precision FODS use interferometry, where phase changes in light due to displacement are measured. This technique offers extremely high sensitivity but is more complex and costly .

Applications

FODS are widely used in:

- Industrial and aerospace structural monitoring
- Micro-assembly and reverse engineering
- Civil engineering and smart structures
- Medical endoscopes and minimally invasive devices

Price Range

The cost of fiber optic displacement sensors varies based on precision, range, and configuration:

- Basic intensity-modulated sensors: Approximately \$500-\$2,000 per unit.
- High-precision interferometric sensors: Can range from \$5,000 to \$20,000 or more, depending on resolution and environmental specifications .
- Additional costs may include fiber bundles, photodetectors, and signal processing electronics.

Key Advantages

- Non-contact measurement, ideal for delicate or moving targets
 - High sensitivity and resolution
 - Immune to electromagnetic interference
 - Suitable for harsh or remote environments
- Fiber optic displacement sensors provide a reliable, precise, and versatile solution for displacement measurement across industrial, aerospace, and medical applications, with pricing reflecting the complexity and precision of the system.

Article Content

Fiber optic displacement sensor (LVDT), transducer and probe

Fiber optic linear displacement sensor is ideal for real-time monitoring of civil engineering structures, structural monitoring of aircraft,

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

