

Rotational speed detection based on fiber optic sensor



Article Overview

Fiber optic sensors provide precise, non-contact measurement of rotational speed using light-based detection methods.

Working Principle

Fiber optic rotational speed sensors operate by detecting changes in light caused by the motion of a rotating object. Typically, a light source is coupled to an optical fiber, which directs light toward a reflective or marked surface on the rotating shaft or wheel. As the object rotates, variations in reflected light or phase shifts in the fiber are captured by a photodetector or light analyzer, which converts these optical signals into electrical pulses. The frequency of these pulses is proportional to the rotational speed, allowing calculation of RPM or angular velocity (). Some advanced designs use birefringent optical fibers combined with magnetostrictive materials. In these systems, a toothed wheel rotates within a magnetic field, inducing stress in the fiber. The resulting phase changes in the transmitted light are analyzed to determine the periodic variations caused by the rotating teeth, providing highly accurate speed measurements even under harsh conditions ().

Types of Fiber Optic Rotational Sensors

- **Optical Tachometers:** Non-contact sensors that detect reflective markings or surface features on a rotating object. They often include a TTL output and high bandwidth (up to 100 kHz) for fast response ().
- **Rotary Encoders:** Fiber optic encoders can measure angular position and rotationa...

Article Content

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A device for measuring the rotational speed of a shaft. A toothed wheel is connected to rotate with the shaft within a magnetic field. A

Dynamic Rotational Sensor Using Polymer Optical Fiber for Robot ...

This work presents a dynamic rotational sensor using polymethyl methacrylate (PMMA) fiber for robot movement assessment. The

Rotation Active Sensors Based on Ultrafast Fibre Lasers

By employing the optical Sagnac effect, ring laser gyroscopes provide exceptionally accurate measurements of even ultraslow

Fiber-Optic Rotation Sensors. Tutorial Review

All the optical rotation sensors under development are based on the Sagnac effect which generates an optical path difference nL

Advanced Optical Measurement Techniques for Rotating Machinery ...

Keywords Optical measurement, rotating machinery, laser Doppler vibrometry, fiber-optic sensors, crystal-optical method, infrared

Fiber-optic sensor

A fiber-optic sensor is a sensor that uses optical fiber either as the sensing element ("intrinsic sensors"), or as a means of relaying

Fiber Optic Sensor

Fiber optic sensors are defined as sensing devices that utilize optical fibers to convert lightwave properties into information about the

Design and Development of Fiber Optic Sensor System for Rotational ...

Abstract: In this paper, a fiber optic sensor system (FOSS) is proposed for the measurement of the rotational speed of a DC motor. It

Dynamic Rotational Sensor Using Polymer Optical Fiber for Robot ...

Abstract: A complex signal processing technique is usually required to process the data in most sensor design structures, and

Dynamic Rotational Sensor Using Polymer Optical Fiber for Robot ...

A simple and straightforward polymer fiber-optic dynamic rotational sensor for robot movement assessment was proposed in this

Fiber-based broadband detection of a rotational object with

In this paper, a fiber-based configuration, utilizing rotational Doppler measurements, is reported for detecting rotation.

Fiber Optic Rotation Sensor (FORS) Signal Detection and Processing

The recent development of low-loss single-mode optical fiber waveguides for light has made possible a new class of inertial

Fiber-Optic Rotation Sensors. Tutorial Review

S. Ezekiel et al. (eds.), Fiber-Optic Rotation Sensors and Related Technologies
Springer-Verlag Berlin Heidelberg 1982 767aircrafts

Rotational speed sensors based on a fiber Bragg grating

All these fibre optic rotation sensing techniques suffer the problem of the ceiling of detectable rotating speed: The FBG

optical rpm sensor

Optical RPM sensors utilize cutting-edge technology to measure rotational speeds with precision. These sensors operate based on

Fiber optic sensor embedded in robotic systems for 3-D orientation ...

Moreover, optical fiber-based 3-D rotational sensors are still difficult to achieve as well as challenging to integrate into

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