HBK
HOTTINGER BRÜEL & KJÆR

OPTICAL FIBER
BRAGG GRATING TECHNOLOGY

Bringing Light to Measurement

HBK optical sensors are based on Fiber Bragg Grating (FBG) technology. Easy to install, electromagnetically safe and suitable for highly explosive atmospheres, optical sensors are the ideal choice for numerous applications across all industries. A single system can simultaneously acquire signals from a high number of sensors measuring different parameters and spread along the same or multiple fibers over several kilometres – a cost-effective solution for obtaining reliable meaningful data.

Contact us
to learn more about
HBK optical sensors!

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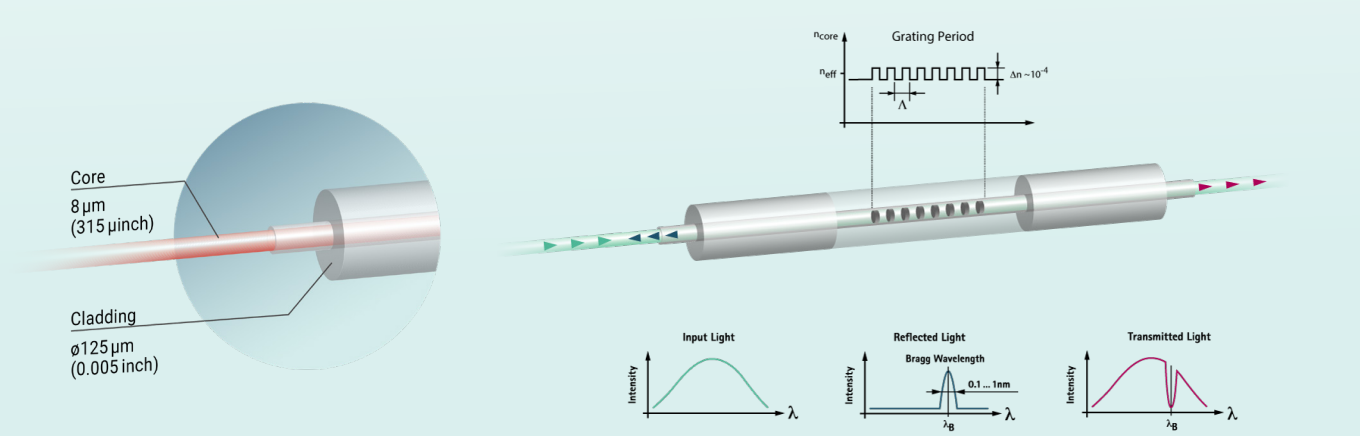
Quick and Easy: About Fiber Bragg Grating Technology

WHAT IS A FIBER BRAGG GRATING?

A fiber Bragg grating is a microstructure that is a few millimetres long and that can be photo-inscribed in the core of a standard single-mode telecom fiber using laser light. It consists of a periodic refractive index change that results in operation as a wavelength selective mirror. The reflected wavelength can be related with the environment surrounding the optical fiber, allowing the measurement of several physical parameters (strain, temperature, tilt, acceleration, etc.).



HOW DOES A FIBER BRAGG GRATING WORK?

When broadband light is injected into the fiber, a narrow spectrum of the incident light is reflected at the fiber Bragg grating. This reflection is centered at the Bragg wavelength, which is dictated by the period of the microstructure and by the effective refractive index of the optical fiber core. The remaining light is transmitted and can be used to illuminate other FBGs with different periods, which can be located close (within a few millimetres) or very far (several kilometres). Measurements of physical parameters are based on the changes induced by the measurands on the Bragg wavelengths.

Strain and temperature

A FBG is intrinsically sensitive to strain and temperature. The sensitivity to strain arises essentially from the FBG period change when the fiber is stressed or compressed, since the contribution induced to the refractive index is small. Also, the Bragg wavelength change with temperature is due to the thermal dependence of the fiber refractive index and to the thermal expansion of silica.

Sensing other parameters

FBGs can be used to measure other physical parameters by mechanically transferring the displacement, acceleration, tilt, force, etc., into strain applied to the optical fiber, using different transduction mechanisms. Moreover, temperature sensors are usually designed to ensure isolation of any mechanical influence on the FBG, so that only the effect of temperature is measured.

Compensation

Due to the FBG's intrinsic sensitivity to temperature, thermal effects require compensation when other measurements are performed. This can be attained by using a second FBG, being the thermal cross effect cancelled by calculation. Alternatively, temperature compensation can be directly integrated on the sensor, for example by using two FBG in push-pull configuration.

WHY USE FIBER BRAGG GRATING SENSORS?

Reduce costs

Access remote locations

Operate in hazardous areas

Match new materials

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