

# FBG DISTRIBUTED SENSING

MAP YOUR TEMPERATURE AND STRAIN PROFILE WITH FBG SENSING

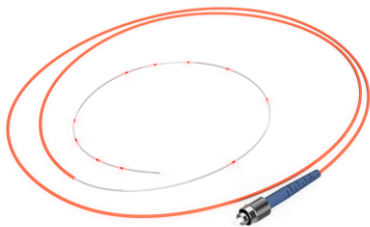
Photon Control offers an innovative fiber Bragg grating (FBG) system providing a distributed sensing solution to measure temperature and strain over large areas and long distances.



- FBG sensors enable comprehensive sensing for critical asset monitoring in infrastructure, utilities, renewable energy, automotive, and industrial sectors to increase safety, enable smarter asset management, and reduce maintenance costs.
- The sensors are rugged, miniature, and immune to RF and electromagnetic fields and high voltage, providing reliable measurements in harsh environments.
- This unique FBG technology is affordable compared to other discrete and distributed sensing solutions.

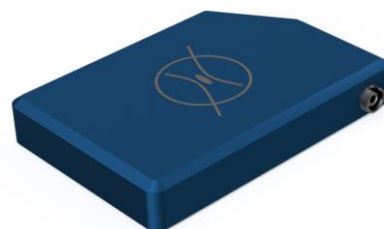
## FBG Sensor System

The system includes an **FBG Interrogator** measurement device and an **FBG Sensor Chain**, a single optical fiber with multiple temperature and strain FBG sensors. The sensor chain can consist of up to 30 FBG sensors per fiber over a maximum length of 500 m.



### FBG Sensor Chain

Rugged, flexible, and customizable FBG sensor chains for multipoint sensing.



### FBG Interrogator

Compact, high-resolution, and fully integrated FBG interrogator.

*Specifications are subject to change without notice*

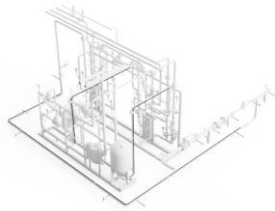
## Applications

Effectively use the FBG system in applications that require:

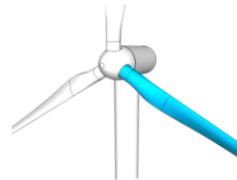
- Temperature or strain measurements over large areas or long distances
- Harsh environments – RF, electromagnetic fields, high voltages



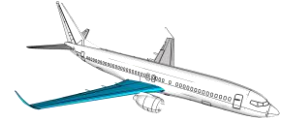
INFRASTRUCTURE



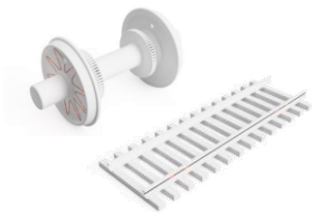
UTILITIES



RENEWABLES



AEROSPACE



TRANSPORTATION



INDUSTRIAL



AUTOMOTIVE



MEDICAL

## Why FBG?

### Fiber optic solution

- Inherently safe
- Immune to RF, microwave, electromagnetic fields, and high voltages
- Reliable in extreme temperatures

### Small form factor

- Small fiber diameter
- Flexible down to 5 mm bend radius
- Easy to install in constricted spaces

### Multipoint measurement

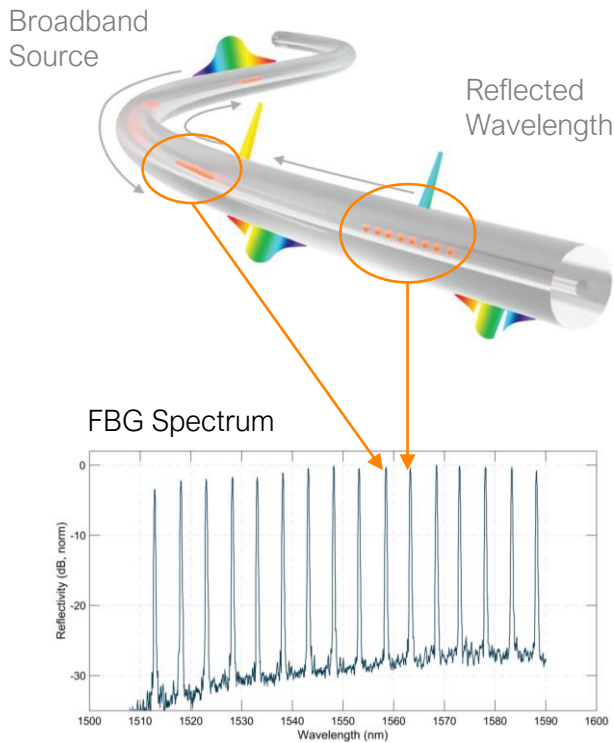
- Contains up to 30 sensors per sensor chain
- Measures distances as long as 500 m
- Measures both strain and temperature on one fiber
- Reduces wiring complexity

### Cost-effective solution

- Lowest cost per measurement point with 4 or more sensors

Specifications are subject to change without notice

# Technology

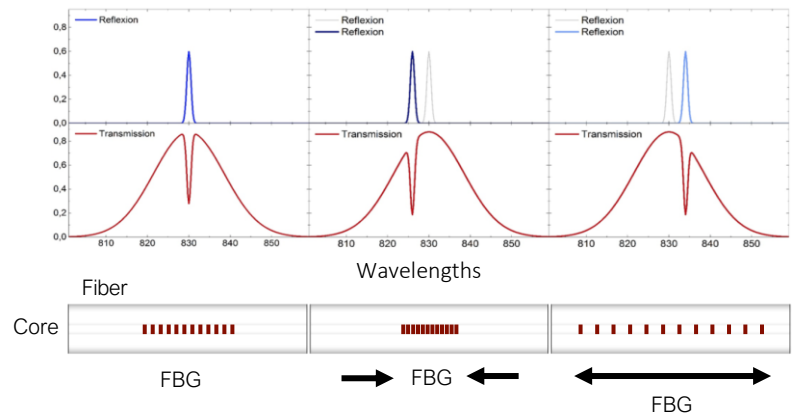


A fiber Bragg grating (FBG) is a microstructure within the core of an optical fiber comprising a periodic modulation of the refractive index of the underlying glass material. When broadband light hits the periodic microstructure, one specific wavelength band is reflected, and all other wavelengths are transmitted.

The periodic modulation that is inscribed into the glass of each FBG like a spectral fingerprint defines the specific wavelength band that it reflects. If an external force or change in temperature is applied to the microstructure, the periodic modulation of the FBG will change slightly, causing the wavelength band that the FBG reflects to shift.

When the FBG sensor is exposed to strain or temperature, the reflected wavelength shifts:

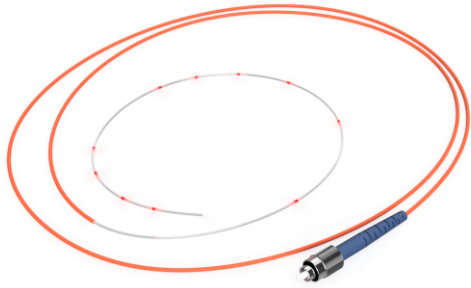
- When the FBG is compressed (strain), the wavelength decreases
- When the FBG is stretched (strain), the wavelength increases
- When the temperature changes, the FBG deforms and refractive index changes, both of which cause the reflected wavelength band to increase or decrease



The shift in wavelength is used to calculate the strain or temperature

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## Product Specifications



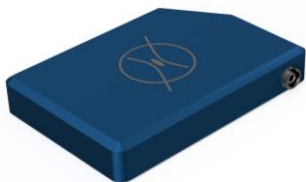
### FBG Sensor Chain Specifications

Grating Length	1 mm
Grating Spacing	Min 1 mm
Number of FBGs	Up to 30
Fiber Length	Up to 500 m
Fiber Bend Radius	Min 5 mm
Temperature Range	-40 °C to 350 °C
Bare Fiber Coating	Polyimide
Sensor Capillary Options	PEEK, Stainless Steel, Silica

### FBG Interrogator Specifications



X100



X150

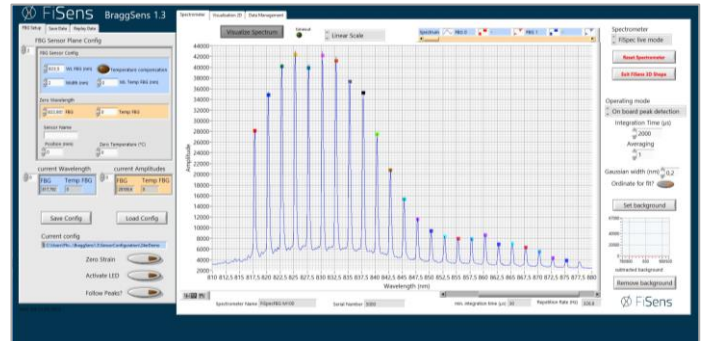
Interrogator	X100	X150
Number of Channels	1	
FBG Sensors per Channel	30	25
Sampling Rate	1 to 100 Hz	1 to 300 Hz
Wavelength Range	808 to 880 nm	808 to 865 nm
Strain Precision (1 Hz)	1 $\mu\epsilon$	0.1 $\mu\epsilon$
Temperature Precision (1 Hz)	0.1 °C	0.01 °C
Digital Measurement Res.	0.001 °C / 0.01 $\mu\epsilon$	
Thermal Stability	$\pm 5$ pm/k	
Optical Interface	FC/APC Connector, SM 800 Single-mode Fiber	
Digital Interface	USB 2.0 Hi-speed / 5 V	
Power Consumption	5 V @ 1 W	5 V @ 1.5 W
Dimensions	65 mm x 48.5 mm x 15.3 mm	100 mm x 68 mm x 15 mm
Weight	60 g	120 g
Operating Temperature	0 °C to 60 °C	
Storage Temperature	0 °C to 80 °C	

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# Software

BraggSens is LabVIEW-based software that enables data acquisition and analysis, with the following features:

- Acquire and display spectra
- Dynamic peak detection of each FBG signal
- Data recording and playback
- Automatic calculation of wavelength-dependent strain and temperature shift
- Dark spectrum removal
- Manual sensor configuration possible
- Import and export mosts ASCII-based file formats



Photon Control is a leading manufacturer and distributor of fiber optic sensors for the semiconductor and other high-tech industries

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**PHOTON CONTROL**  
Micronor LLC  
900 Calle Plano, Suite K  
Camarillo, CA 93012 USA

**Contact Us**  
+1.805.389.6600  
fbg@photoncontrol.com  
www.photoncontrol.com