ASCANIO SENSING

ENEA Spin-off

FBG Jointmeter

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info@ascaniosensing.it

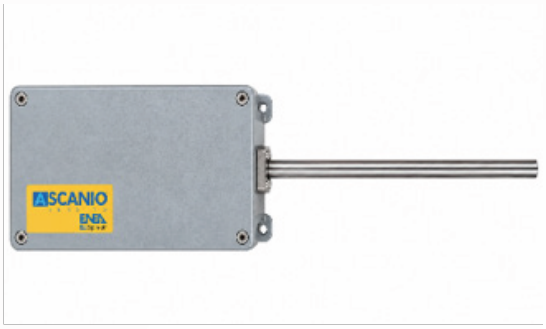


FBG Jointmeters are intended to monitor the movement between two anchors.

FBG Jointmeters are designed as a box with a piston. The piston body spans across the joint to be monitored. The piston end and the box can be anchored both by bolting and by embedding in poured materials.
An optional corrugated armoured tubing allows the free movement of the piston in case of installation across the joint of newly poured structures.
Both the box and the piston are available in customizable size, shape and material, as best suited to the specific application.
Inside the box, two FBG sensors provide temperature compensation and measurement of the piston displacement, with widely customizable measurement range and resolution.
FBG Jointmeters have a pass-through optical design, to allow in-series cabling of other sensors based on the FBG technology. Optical cabling can be provided as an umbilical twin cable, a rugged twin connector or a trunk cable enclosure.



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APPLICATIONS

FBG Jointmeter are optical displacement sensors based on the Fibre Bragg Grating technology and offer many advantages with respect to the traditional (electrical) displacement/deformation sensors.

- long term stability for structural static monitoring (monitoring of long-term settling, …)
- immunity to e.m. noise (monitoring close to power lines, …)
- easy cabling (sensors can be connected in series, …)
- no power supply at the monitored point (passive conditioning of the optical signal, …)



TYPICAL APPLICATIONS

- monitoring of concrete dams
- monitoring of large concrete structures
- monitoring of large rock fractures
- monitoring of tunnels

AVAILABLE SERVICES

- built-in thermal deformation compensation
- multi-fibre pass-through optical cable
- chain-of-sensors on uninterrupted optical cable
- metallic shield and armoured optical cable

AVAILABLE OPTIONS

- support for monitoring system planning
- sensor installation and cabling
- data acquisition management

SPECIFICATIONS

- Range: ±1 cm, ±10 cm, …
- Sensitivity: 0.01 FS
- Accuracy: 0.01, 0.03, 0.05 FS (1)
- Geometry: custom shape
- Umbilical cable: pass-through; custom length at both ends; custom armouring according (2)
- Connector: pass-through; rugged twin connector or a trunk cable enclosure (2) to protection requirements

(1) Depends on the data acquisition system

(2) Options on request

SCH-JMT_REV001

ASCANIO S.r.l.
Loc. Lopilato, 8 - Staletti 88069 (CZ) - ITALY
C.F./P.I. Catanzaro 03921500793
N.REA CZ 222346 - CUU KRRH6B9 - Duns Number 442648851
www.ascaniosensing.it

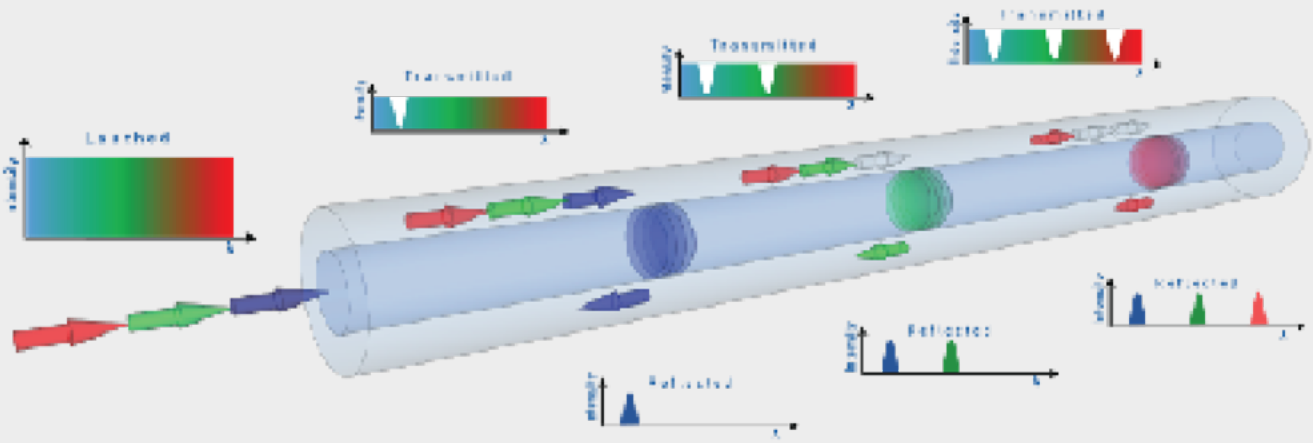
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FIBRE BRAGG GRATING (FBG)

Bragg gratings are produced by modulation of the refractive index of a small segment of an optical fibre, typically 10mm long. The short optical fibre segment corresponds to the sensor, while the optical fibre only delivers the signal of the sensor to the datalogger. Bragg gratings acts as reflection pass-band filters, as sketched in the figure.

A narrow and peaked band is reflected at the grating, while the other wavelength components propagates. Multiple Bragg grating can stay along one optical fibre, each tuned to reflect a well distinct peaked band. The peak wavelength reflected by each Bragg grating strongly depends on its temperature and tensional state: a variation of those two features causes a variation of the reflected peak wavelength.
The measurement of the reflected peak wavelength allows to measure the temperature and deformation variation occurring at the Bragg grating. Bragg gratings can thus be used as temperature or strain sensors by attaching them in thermal or structural contact with the object to be monitored. By use of special devices acting as transducers, Bragg gratings can measure a multiplicity of parameters, such as tilt, relative displacement, acceleration, humidity, ... and more.

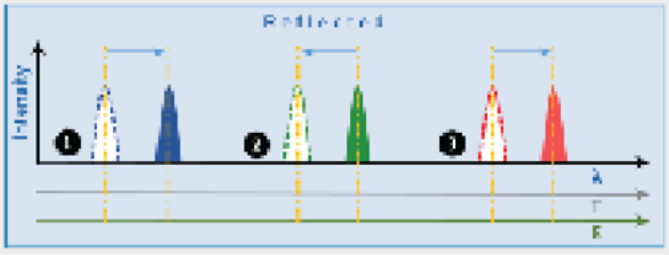
The signal of multiple Bragg gratings connected in-series along the optical fibre are all collected to the same channel of the datalogger and discriminated among each other by wavelength division multiplexing.



As the light propagates along the fibre, each Bragg grating reflects some narrow band peaked light.

Bragg gratings are tuned to reflect each a narrow band peaked at a different wavelength, so that all Bragg gratings can be interrogated. Each peak experiences a shift if the corresponding grating is subject to a temperature or a strain variation.

Temperature and strain measurement is thus encoded in wavelength shift measurement.



The top graph depicts the shift due to:
- Temperature / strain increase at grating 1 and 3
- Temperature / strain decrease at grating 2