DISTRIBUTED FIBRE OPTIC SENSING (DFOS)

Applications

Distributed Fibre Optic Sensing is a means of using Optical Fibres to monitor for changes in strain, temperature, displacement or vibration.

DFOS sensors come in different types suited for varying conditions and purposes.

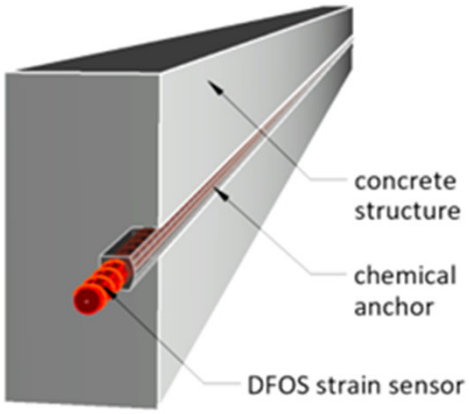
In many situations the ideal solution is a lightweight, flexible sensor comprised of an Optical Fibre and a composite core that protects the fibre while allowing for accurate transfer of strain and good bonding with the monitored structure (e.g. via a chemical anchor).

Variant sensors designed for installation in concrete can have much higher strength and stiffness and can be used to reinforce the structure, similarly to rebar.

Combined sensors incorporating multiple optical fibres in parallel enable the calculation of displacements over the length of the sensor in three-dimensional space.

DFOS systems are particularly suited for installation over long distances, like in road or rail monitoring, but are also useful for small sections of focused monitoring in safety critical areas.

Used widely on various projects across Europe, types of structures that have effectively employed DFOS include monitoring of bridges, pipelines, road embankments, railways and load testing.



Installation & Operation

Optical fibres contained in a flexible, protective composite material are fixed to a structure and read using an interrogator unit to measure and interpret reflected light along the fibre.

In all optical fibres various imperfections in the material cause a small amount of scattering of transmitted light throughout the length of the fibre. These imperfections are a vital feature that create a unique, measurable pattern in the reflected light, similar to a fingerprint for the fibre.
Measuring changes in this fingerprint over time allows interpretation of strain or other factors in the monitored structure.

Different scattering phenomena are used to interpret the frequency and amplitude of the reflected light.
The same sensors may be used for all techniques, but different reflectometers/interrogators may be required to collect the necessary data.

Specifications

Sensor Type:
- EpsilonSensor

Resolution (strain):
- 1.0 με

Range:
- ±4%.

Temp Rating:
- -20 to +80°C

Dimensions:
- Ø3 mm
- (Custom made to any length)

Weight:
- 13 kg/km

Key Advantages

High Resolution, Long Distances:
Sensors can provide geometrically continuous measurement over many kilometres.

Non-Invasive Installation:
No requirement for additional cables and the option to embed sensors into the monitored structure.

Cost Efficient:
Sensors can cover large distances and have long lifespans allowing for significant savings on long term structural health monitoring.