SensO

Fiber Optic Cables for Distributed Fiber Optic Sensing

prysmian

The planet's pathways

ABOUT PRYSMIAN

Prysmian is a global cabling solutions provider leading the energy transition and digital transformation

With 150 years of experience, Prysmian has been established as a leader in the energy transition and digital transformation. Founded in 1879, Prysmian has grown into a global leader in the production of electrical and fiber-optic cables.

Along the years, Prysmian has developed several Fiber Optic Cables for special applications, contributing to our extensive expertise in fiber-optic technology.

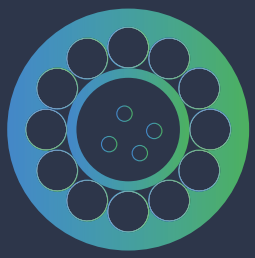
PRYSMIAN SensO

Fiber Optic Sensing Cables

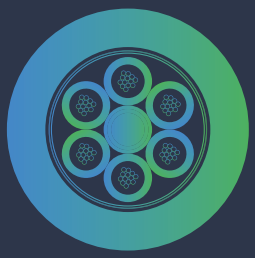
Distributed Fibre Optic Sensing (DFOS) is a technique that is becoming more and more relevant in monitoring critical assets and infrastructures. By analysing the interaction of light with the glass structure of the optical fiber, any existing optical fibre in an optical network infrastructure can become a continuous linear array of intelligent sensors that can be used to measure events through different technologies of data acquisition.

Prysmian has a wide portfolio of Fiber Optic Cable Sensors specifically designed to provide the highest performance levels through different data acquisition technologies, even combining all of them through a single cable type.

A wide portfolio of technologies:

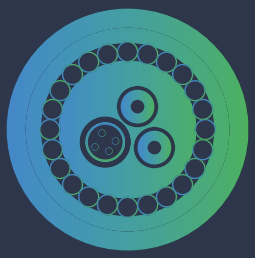


SensO DTS
Distributed
Temperature Sensing



SensO DAS
Distributed
Acoustic Sensing

SensO DSS
Distributed
Strain Sensing



MultiSensO
Distributed
Multiple Sensing

With DFOS, the optical fibre replaces hundreds or even thousands of discrete sensors. Allowing monitoring 24/7 from a single location, providing accurate information along tenths of kilometres with no maintenance requirements.

Different core configurations, fiber types, jacketing, armouring materials, and other specific compounds can be adjusted to provide the most efficient cable construction in response to the nature of the application and environmental requirements.

SensO

SensO DAS

Distributed Acoustic Sensing (DAS) technology transforms fiber optic cables into continuous, highly sensitive sensors capable of detecting acoustic signals and vibrations along their entire length.

Laser pulses are sent through the fiber, and the backscattered light is typically analysed through Rayleigh principle. Changes in the scattered light indicate disturbances along the fiber, allowing the system to determine the location, intensity, and frequency of the vibrations, becoming a cost-effective, linear and real time reliable sensor.

Gas Pipeline leak detection

SensO DAS-Leak cables detect noises and disturbances caused by the pressure differences between the gas inside the pipeline and the external environment. The systems can identify the leak with high accuracy, enabling rapid response and mitigation works. **SensO DAS-Leak** cables are designed to be attached to the pipes, carried in ducts, or directly buried in the soil. For Oil&Gas industry, specific protected cables can be used to withstand harsh environmental conditions (Chemicals, Oils, Vermin, Termites, Fire).

Border intrusion control

SensO DAS-Hard cables detect and classifiy activities like walking, crawling, digging, or vehicular movement along borders in real-time. This technology provides actionable intelligence for rapid response and enhances situational awareness. **SensO DAS-Hard** cables are small, light, flexible and robust enough to be directly clamped in fences or buried in soil, with no need for extra protection or encasement. This is a long-term, cost-effective solution for military and civilian perimeter control systems.

Railways monitoring

DAS systems can monitor the condition of rail tracks, detecting issues like broken rails, wagon defects, train traffic, and track intrusions. **SensO DAS-Rail** cables comply with the highest standards of railways industry regulations, while ensuring a dual capability of network communications and sensing using a single cable. Hybrid cables with fibers and copper conductors are available. Cables can be installed in trays, directly clamped on walls in tunnels, or buried along the tracks. Low smoke Zero Halogen, Rodent protected and CPR rated.

Rockfalls and landslides

Transport infrastructures are usually located close to risky and unstable areas. Roads and railways can be blocked due to rockfalls from surrounding mountains, or land instability due to geotechnical factors. **SensO DAS** cables detect the vibrations originated by the impact of rocks falling in the road or track, with exact location and in real time. **SensO DAS** cables can be installed directly buried, inside ducts, or be laid aboveground running in parallel to the right of way.

Underwater perimeter control

SensO DAS-Aqua cables are designed to operate permanently underwater, with an expected lifetime not less than 30 years, and with a high sensitive fiber core to detect acoustic events. **SensO DAS-Aqua** cables combine the features of light submarine fiber cables, with high sensitivity to detect acoustic events. Detecting illegal fishing activities, non-authorized intrusions on ports and harbours, or ensuring the integrity of underwater cables and pipelines, are typical cases of use.

SensO DTS

Distributed Temperature Sensing (DTS) technology uses optical fibers to measure temperature along the cable length. This method provides a continuous temperature profile rather than discrete point measurements.

Optical Fibers work as distributed temperature sensors. The temperature is measured by analysing the interaction of light with the glass structure of the optical fiber. Prysmian **SensO DTS** cables are designed to operate under the harshest conditions, while prevailing efficient sensitivity for data acquisition typically through Raman or Brillouin scattering technologies.

Fire Detection in Tunnel or Gallery

SensO DTS-Fire cables are typically installed on the top of the tunnels, and can be used for both equipment control and fire detection purposes. Can be directly clamped or laid in trays, and are compliant with the applicable standards for smoke and halogen emission, CPR and performance under fire conditions.

Pipeline leak detection

Due to the difference of temperature or pressure between the transported fluids and the surrounding soil, leaks are detected and localized precisely along the pipeline route. **SensO DTS** cables are suitable to work in a wide variety of applications and cases. For Oil&Gas industry, specific protected cables can be used to withstand harsh environmental conditions (Chemicals, Oils, Vermin, Termites, Fire) For Drinking Water pipelines, underwater cables with special health harmless compounds are available.

Cryogenic LNG monitoring

SensO DTS-Cryo cables can detect a leakage between the walls of LNG tanks, or along the transport and jetty pipelines in few seconds. Due to specific cable design to withstand up to -190°C, the sensor stills operative while alarms are generated and analysed by the user.

Industrial process heat detection

Monitoring of industrial processes in a facility. Cost-efficient solution compared to thermocouples or other spot sensor-based solutions. Looping different sites on the facility, a wide area can be covered using only one fiber optic cable. DTS linear heat detection is a good solution for preventive maintenance in areas with difficult access to facility personnel. **SensO DTS-HT** cables withstand extremely high temperatures up to 600°C.

SensO DSS / MultiSensO

Distributed Strain Sensing (DSS) technology provides spatially resolved strain profiles along a fiber-optic cable.

DSS uses optical fibers to measure strain variations over distance, relying on Brillouin scattering phenomenon, where laser light is sent through the fiber, and the backscattered light is analysed to determine strain levels.

MultisensO cables family integrate the capacity to monitor different DFOS events using a single cable. This is the most effective solution specially for strain measurements while temperature compensation is required.

Viaduct and Bridges Structural health

SensO DSS or **MultiSensO** cables are attached or glued to the infrastructure and detect elongations or compressions that may affect its integrity. This may happen due to degradation of the materials, or due to external events such seismic activity, impacts, or extreme weather conditions.

Water Dams structural integrity

Fiber optic structural health monitoring systems are essential for dams, providing early detection of issues such as leaks, settlements, and soil liquefaction. These systems use distributed fiber optic sensors to continuously monitor strain in 3 axis levels, offering real-time data of dam's structural integrity. **SensO DSS** and **MultiSensO** cables are a reliable and effective solution for strain monitoring and temperature compensation.

Tunnel and Galleries monitoring

Monitoring the structural integrity of tunnels and galleries is increasingly important, especially for large projects. **SensO DSS** or **MultiSensO** cables can be embedded behind the walls, becoming a sensitive backbone for any structural overstress. This setup allows for precise detection of structural changes in three dimensions, ensuring the safety and longevity of the tunnel infrastructure.

Pipeline strain risks

Pipelines can be affected by various strain risks that threaten their integrity and functionality. Events like landslides, extreme temperature or pressure changes can cause the pipeline to bend, stretch, or shrink. These physical stresses can deform the pipeline, potentially leading to reduced efficiency and the formation of cracks. **SensO DSS** or **MultiSensO** cables can be attached directly to the pipes to monitor elongations or compressions in real time.

Metallic ropes and Ropeways

Strain sensors are crucial for monitoring the integrity of ropes and ropeways. Metallic **SensO DSS** sensors embedded in the ropes, measure the strain and tension, providing real-time data on the structural health of the system.

Landslides

Fiber optic strain cables are highly effective for monitoring landslides. By embedding these cables along vulnerable slopes, **SensO DSS** or **MultiSensO** cables continuously monitor ground movements and deformations in real time. This allows for early detection of landslide risks, enabling timely warnings and preventive measures.

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