



Fiber Optic Sensors & Sensing Systems

FOS & S

Company Profile

FOS&S (**Fiber Optic Sensors & Sensing Systems**) is a private held company specialized in the development and commercialization of fiber optical sensing systems. The company has been founded out the roots of I.D. FOS Research in 2001. Based on the more than 12 years experience of I.D. FOS Research, FOS&S has build out an extended product and technology portfolio to supply sensing solutions for different market segments: Oil industry, Civil engineering, Geotextile industry, Mining industry and Process industry.



FOS&S' **mission** is to become a world wide reference as solution provider within the fibre optical sensing market for standard as well as non-standard sensing applications that require customized developments.

FOS&S' **strategy** is based on internal development as well as setting up strategic collaborations with other sensing and non-sensing companies in order to compose the best technology and product portfolio to solve our customers' sensing problems.

Technologies and products

FOS&S technologies are all based on fibre optical sensing and can be divided into two main categories: **Fibre Bragg Grating technology** and **Stimulated Brillouin Scattering technology**.

Fiber optical sensors offer several significant advantages over conventional electrical sensors. The most important advantages are:

- They're rugged passive components resulting in a high life time (20 years)
- They form an intrinsic part of the fibre optic cable that can transmit the measurement signal over several tens of kilometers
- No interference with electromagnetic radiation, so they can function in many hostile environments where conventional sensors would fail.
- They don't make use of electrical signals what makes them explosion safe.
- Many sensors can be multiplexed using only one optical fibre, driving down the cost of complex control systems.

Based on these technologies, FOS&S has developed a wide range of sensors to measure all kinds of physical parameters like: **temperature, strain, pressure, earth pressure, load, water leakage, humidity, displacement, deformation, ...**

These sensors can be read out using different interrogation systems going from handheld interrogators to more complex data logging systems for continuous field operation.

SPECTRALEYE INTERROGATOR

The SpectralEye Interrogator is the first handheld interrogation system for Fibre Bragg Grating sensors. The product has been developed by FOS&S in co-operation with Axsun. The system makes the fibre optical sensing accessible for non fibre optical engineers and provides the accuracy needed for a wide range of optical sensing applications.



Services

BEST SOLUTIONS



DEVELOPMENT CUSTOMIZED SOLUTIONS

For some applications no standard solutions can be found. In order to support the customer also for these sensing problems, FOS&S provides consultancy and development services to their customers.

The FOS&S engineering team can assist customers in finding the best solutions to their unique needs. FOS&S technical-application specialists are trained to solve customers' problems regarding product specifications and application constraints.

INSTALLATION AND MAINTENANCE

Besides the development of customized sensing solutions, FOS&S is also able to take care of the installation as well as maintenance of the complete optical sensing network. In this way, FOS&S is able to provide a total solution to their customers.

This allows customers to focus on their core activities without additional training of people and expensive purchases of fibre optical tools and maintenance equipment.

EXCELLENT SERVICE



REPORTING SERVICE



FOLLOW UP AND REPORTING

Follow up and reporting of measurement data is often a very time consuming task. In order to bring reporting costs down for our customers, FOS&S provides a highly automated reporting service. Using modem or wireless connection systems, measurement data from the field are periodically downloaded by FOS&S and processed into a report format that can be viewed and or downloaded by the customer through internet.

In this way, the customer can have all the time a clear overview of his measurement results without losing time to collect and process data and writing reports.

Applications

FOS&S has build up a wide variety of references in different kinds of industries:

- **Oil industry:** Distributed temperature measurement of sub sea oil pipelines
- **Civil engineering:** Health monitoring of bridges and other civil structures. Parameters like strain, load and displacement are measured.
- **Process industry:** Data logging of different process parameters such as pressure, humidity, temperature, ...
- **Mining industry:** Safety monitoring in underground Nuclear Waste repositories. More than 7 mines have already been installed by FOS&S.
- **Geotextile industry:** Development of a survey system for earthwork structures reinforced with geosynthetics in order to increase the safety of civil-engineering infrastructures through cost-effective predictive maintenance.

TOTAL SOLUTION INTEGRATOR

Depending on customers' requests, the engineering team of FOS&S can take care of the complete sensing integration process going from problem analyzing to solution development, implementation, follow up and reporting. Hence, customers are not supposed to have any knowledge about fibre optical technology.

Contact

DISTRIBUTORS

FOS&S standard products can also be purchased using our **world wide** distribution network. Please visit our website to find your nearest FOS&S distributor.



FOS&S

Fiber Optic Sensors and Sensing Systems Inc.

Cipalstraat 14
B-2440 Geel
Belgium



Tel. +32 14 581191
Fax +32 14 591514

Contact: info@fos-s.be

Website: www.fos-s.be

Advantages of Fibre Optic sensors

Fibre optical sensors offer several significant **advantages** over conventional electrical sensors. The most important advantages are:

- They're rugged passive components resulting in a high life time (20 years)
- They form an intrinsic part of the fibre optic cable that can transmit the measurement signal over several tens of kilometers
- They show no interference with electromagnetic radiation, so they can function in many hostile environments where conventional sensors would fail
- They don't make use of electrical signals what makes them explosion safe
- They have the ability to multiplex many sensors using only one optical fibre, driving down the cost of complex control systems

FOS&S' technologies are all based on fibre optical sensing and can be divided into two main categories:

- Fibre Bragg Grating Technology
- Stimulated Brillouin Scattering technology

Description of Fibre Bragg Grating Technology

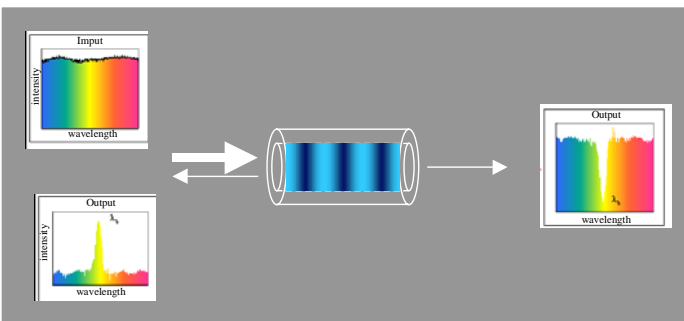


Figure 1: FBG working principle

Fibre Bragg Gratings are made by laterally exposing the core of a single-mode fibre to a periodic pattern of intense ultraviolet light. The exposure produces a permanent change in the refraction index of the fibre's core, creating a fixed index modulation according to the exposure pattern. This fixed index modulation is called a grating. At each periodic refraction change a small amount of light is reflected. All the reflected light signals combine coherently to one large reflection at a particular wavelength when the grating period is approximately half the input light's wavelength. This is referred to as the

Bragg condition, and the wavelength at which this reflection occurs is called the Bragg wavelength. Light signals at wavelengths other than the Bragg wavelength, which are not phase matched, are essentially transparent. This principle is shown in **figure 1**. Therefore, light propagates through the grating with negligible attenuation or signal variation. Only those wavelengths that satisfy the Bragg condition are affected and strongly back-reflected. The ability to accurately preset and maintain the grating wavelength is a fundamental feature and advantage of Fibre Bragg Gratings.

FBG Characteristics

The central wavelength of the reflected component satisfies the Bragg relation: $\lambda_{\text{refl}} = 2 n \Lambda$, with n the index of refraction and Λ the period of the index of refraction variation of the FBG. Due to the temperature and strain dependence of the parameters n and Λ , the wavelength of the reflected component will also change as function of temperature and/or strain, see **Figure 2**. This dependency is well known, what allows to determine the temperature or strain from the reflected FBG wavelength.

Besides temperature and strain, FBGs can be used to measure a variety of other physical parameters such as humidity, pressure, displacement, water leakage,.... This can be achieved using smart transduction mechanisms that convert the physical parameter into a strain value onto the FBG.

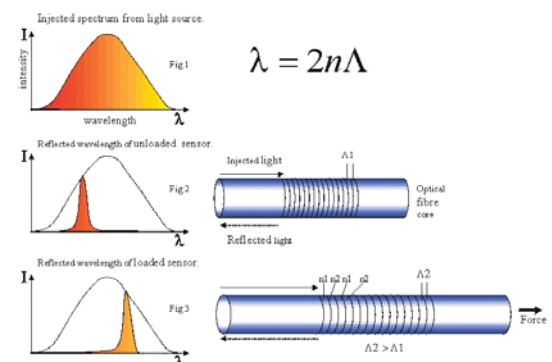
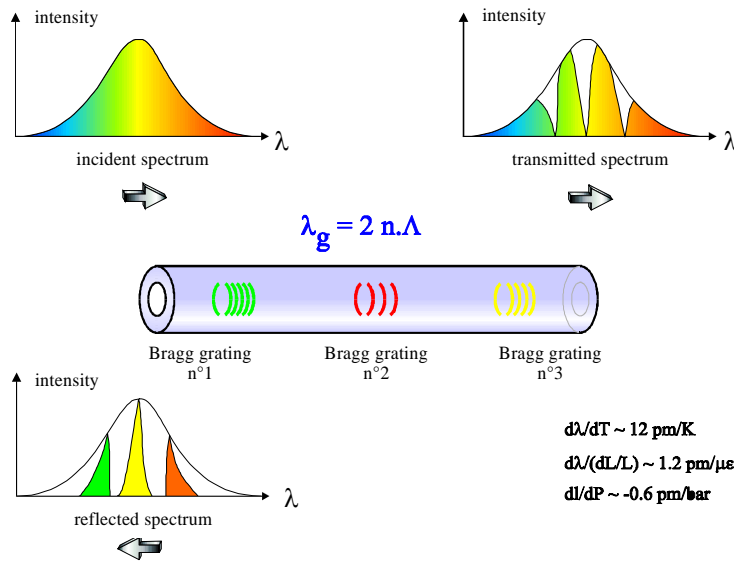


Figure 2: FBG response as function of strain

Multiplexing



The response of different FBG sensors can be monitored using only one optical fibre. This is achieved by putting different FBGs with different wavelengths in a series configuration, see **Figure 3**. Each reflected peak corresponds to a FBG.

The wavelength responses of the different FBGs are recorded using a special designed fibre optic measurement system, operating in the C-band (1530 nm -1570 nm), L-band (1570 nm -1610 nm) or C+L band. The larger the wavelength window, the more sensors can be interrogated in a series configuration.

Figure 3: Series configuration principle of FBG sensors

Monitoring principles

There are two fundamental approaches for monitoring the FBG responses. The first approach is shown in **Figure 4**. It makes use of a broadband light source that couples the light through a 2 by 2 coupler into the fibre where the FBGs will reflect different components. This same coupler guides the reflected light, coming from the different FBGs, into an Optical Spectrum Analyser (OSA) module where the different peak wavelengths are calculated. If more than one sensing fibre is used, an additional optical switch is needed to make the interrogation of the different fibres possible. The control of the measurement system as well as the wavelength to parameter conversion is established using a graphical user interface that can be run from a laptop or desktop P.C.

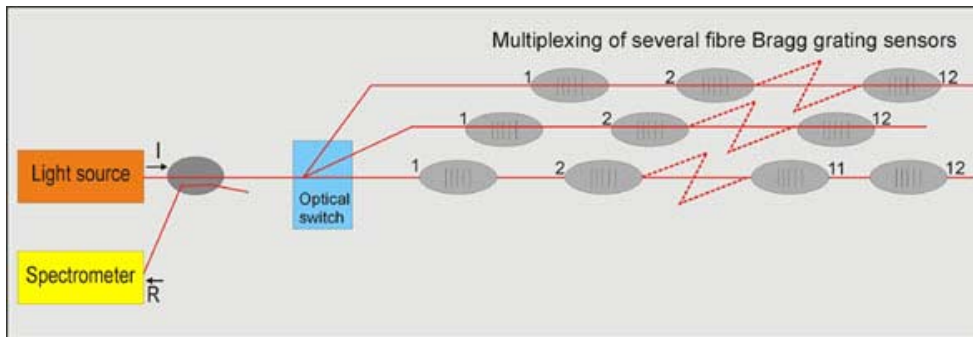


Figure 4: Working principle of the fibre optic measurement system using a broadband light source.

In the second technique, a narrowband tunable laser is swept across the appropriate spectral region, and a reflected signal is observed with a broadband detector only when the laser is precisely tuned to the sensor's reflectivity.

Spectraleye™ 600 Interrogator Family



Description

The SpectralEye Interrogator 600 is a handheld interrogation system for Fibre Bragg Grating (FBG) sensors.

This device provides powerful, reliable, easily integrated measurement options, for Fibre Bragg Grating and other optical sensor developers and system integrators. The speed, narrow linewidth and superb repeatability of the integrated Optical Spectrum Analyser (OSA) provide the accuracy and resolution needed for a wide range of optical sensing applications.

With its rugged design, configuration flexibility, small size, standard integrated battery and low cost, the SpectralEye Interrogator is designed to meet the diverse needs and challenging requirements of the fibre optic sensing community.

Operational flexibility is another important advantage of the SpectralEye Interrogator family. Application software can be customized to display temperature, strain or any other physical parameter. SpectralEye Interrogators can even be operated in a passive optical spectrum analyzer mode, displaying power versus absolute wavelength and can be directly controlled using a laptop or other PC for on-line monitoring. An optional integrated HP iPAQ™ Pocket PC provides extended communications, control, storage and display flexibility.

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and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Spectraleye™ 600 Interrogator Family

Features

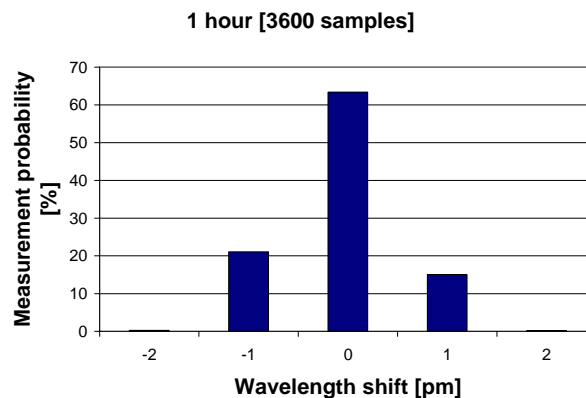
- 10pm Wavelength Accuracy
- 40nm Scan Range
- 3 mW Launch Power
- 1pm Resolution
- Fast Scan time
- 120 Minute Battery Operation
- RS-232 Interface Extended communication
- USB

Standard specifications

Parameter	Unit	Value
Wavelength Range	nm	1527 - 1567
Source Launch Power	mW	3
Wavelength Accuracy*	pm	±10
Wavelength Resolution	pm	1
Scan Time	s	1
Dynamic range	dB	> 20
Loss budget	dB	15
Operating Temperature	°C	0 - 45
Weight	kg	1.3
Battery Life	Min.	120
Mechanical Dimensions	WxDxH (mm)	200x135x45
Interfaces		
RS-232		DB-9
USB 2.0		USB-B
Optical		FC/APC
Battery Charger		DC-input jack

* One-Year continuous operation

Wavelength stability



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F +32 14 59 15 14
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Released: April, 2006

FBG-Datalogger



Description

The FBG-Datalogger is a compact, low-cost and completely intelligent, portable device that can monitor up to 16 different optical lines. The core of the device is a state-of-the-art Fabry Pérot tunable filter. The FBG-Datalogger is controlled with a built-in computer and touch screen. Controlling through TCP/IP, RS232 or GPRS is possible as an option.

The FBG-Datalogger provides powerful, reliable, easily integrated measurement options, allowing Fibre Bragg Grating (FBG) and other optical sensor developers and system integrators to focus on customer application needs and installation requirements.

The FBG-Datalogger was specifically designed to meet the diverse needs and challenging requirements of the fibre optic sensor community. The speed, narrow line width and superb repeatability of the Interrogator provide the accuracy and resolution needed for a wide range of optical sensing applications.

Features

- 10pm Wavelength Accuracy
- 40nm Scan Range
- 5 mW Launch Power
- 1pm Repeatability
- Fast Scan time
- 8 or 16 optical lines

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

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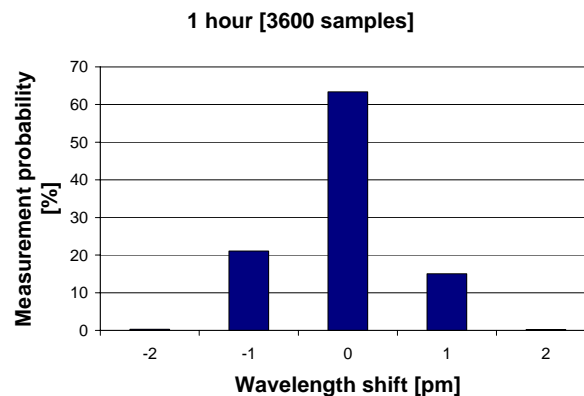
Standard specifications

Parameter	Unit	Value
Wavelength range	nm	1527-1567 nm
Number of Bragg sensors/channel	-	120
Number of optical lines	-	8 – 12 - 16
Wavelength repeatability	pm	±1
Wavelength accuracy*	pm	±10
Source launch power	mW	5
Dynamic range	dB	> 20
Loss budget	dB	15
Scan and report time	s	1
Switching time	ms	10
Operating temperature	° C	0 – 50
Power supply	V	12
Adapter	VAC	110-220
Optical connector	-	FC/APC
Dimensions**	WxDxH (mm)	270x180x175
Weight	kg	4
Embedded PC specifications		
Processor	Mhz	400
Memory	Mbyte	512
Data storage (expandable)	Mbyte	512 (2048)
Touch screen (resistive)	pixels	1024 x 768
Operating temperature	° C	0 – 50
Communication	USB RS232 TCP/IP (networking) GPRS (optional)	

* One-Year continuous operation

** 19" mounting brackets standard delivered

Wavelength stability



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DynoSense 300



Description

The DynoSense 300 is a high scan rate interrogation system for monitoring Fibre Bragg Grating sensors. The system is a result of a joint development between XenICs and FOS&S.

The DynoSense 300 can monitor up to 40 FBGs and supports three function modes:

- Wavelength mode: in this mode the wavelengths of the different FBGs are recorded as function of time at a scan rate of 3,3 kHz
- Spectrum mode: this mode allows to visualize the complete optical spectrum and is for instance of interest for diagnostics of the sensing network
- Fast Fourier Transform mode: in this mode the FFT of the recorded wavelength signals is online processed

The system can be controlled with a standard PC via Camera Link or Gigabit Ethernet.

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and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.com
www.fos-s.com

Released: October, 2006

DynoSense 300

Features

- High scan rate: 3.3 kHz
- Broad wavelength window: 1520-1580 nm
- Easy user interface
- Integration time can be software controlled allowing adjustment of measured optical intensity range

Standard specifications

Optical parameters	Unit	Value
Wavelength range	nm	1520-1580
Number of Bragg sensors	-	40
Number of optical lines	-	1
Wavelength repeatability	pm	<5
Wavelength resolution	pm	<1
Wavelength accuracy*	pm	35
Total dynamic range	dB	20
Scan rate	kHz	3.3
Optical connector	-	FC/APC
Electronic parameters		
Digital data interface	CameraLink Gigabit Ethernet (GigE)	
Power supply	V	12
Operating conditions		
Humidity	-	non-condensing
Operating temperature	° C	-10 to 50°C
Mechanical parameters		
Dimensions**	WxDxH (mm)	117x240x120
Weight	kg	2,5
Weight power supply	kg	0.25
Connectors	Power connector Extra power connector if GigE USB connector (control) External trigger connector CameraLink connector Optical connector	

* Wavelength accuracy guaranteed over one year

Information furnished by FOS&S is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications are subject to change without notice. This information supersedes all previously supplied information.

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and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.com
www.fos-s.com

Released: October, 2006

Optical switch 1x8



Description

The Optical switch 1x8 is a compact and low-cost device which provides easy setup and extension of the measurement network. The optical switch has 1 input channel and 8 output channels. The switch is software controlled using RS 232 connection and does not require any other external power supply.

The Optical switch 1X8 product family was specifically designed to meet the diverse needs and challenging requirements of the fibre optic sensor community. The speed, low loss budget and repeatability make it excellent for optical sensing applications.

Features

- 8 optical channels
- Fast switching time
- RS 232 connector
- 5V power is required

Standard specifications

Parameter	Unit	Value
Wavelength range	nm	1520-1610 nm
Number of optical lines	-	8
Insertion loss	dB	<1
Switching time	ms	30
Operating temperature	° C	0 – 70
Power supply	-	5V DC
Optical connector	-	FC/APC
Laptop Connection type	-	RS232

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and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be



Description

The **sm125 Optical Sensing Interrogator** meets the growing demand for measuring strain, pressure and temperature in civil, down-hole oil, and pipeline applications where both high accuracy and low cost are required. Most of these applications require the durability and versatility of the Fibre Bragg grating based strain, temperature and pressure sensors for which the **sm125** is well suited.

The small, accurate, powerful and economical **sm125** combines an industrial PC with **Micron Optics'** robust, high-power, low-noise swept laser source. **Micron Optics** instruments are installed in hundreds of harsh applications around the world from oil platforms in Brunei to marine vessels in the North Sea to tunnels in Japan.

Applications

- Long-term field measurements of multiple fibre Bragg grating and extrinsic Fabry-Perot sensors
- Analysis of fibre Bragg grating sensor behavior and shape using internal, high-powered, high dynamic range detection circuitry
- High volume OEM applications where custom capabilities are required
- Sensing and measurement of strain, temperature, pressure, etc.

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Standard specifications

Optical	200	500	700
Number of optical channels	1	4	4
Wavelength Range	1520 to 1570 nm	1510 to 1590 nm	1510 to 1590 nm
Wavelength accuracy ¹	10 pm	1 pm	2.5 pm
Wavelength stability ²	5 pm	1 pm	2.5 pm
Wavelength repeatability ³	0.5 pm at 1Hz, 0.2 pm at 0.1Hz		
Dynamic range ⁴	40 dB	50 dB	30 dB
Scan frequency	1 Hz		5 Hz
Typical sensor spacing	> 2 x Sensor Bandwidth		
Optical connectors	FC/APC		
Electrical & Mechanical			
Input voltage	+5 VDC		
AC/DC convertor	Included		
Power consumption	18 W typ, 30 W max		
Local data storage ⁵	optional		
Interfaces	Ethernet (TCP/IP)		
Protocols	Custom MOI protocol via Ethernet		
Dimensions	114 mm x 234 mm x 132 mm		
Weight	2 kg		
Options			
Wireless PDA kit	Wireless Ethernet communication, USB adapter, PDA and PDA utilities		
PDA utilities software	Data display, data logger and instrument control		
Channel expansion	Up to 16 channels		

¹ Per NST Technical Note 1297, 1994 Edition, Section D.1.1.1, definition of "accuracy of measurement"

² Captures effects long term use over full operating temperature range of the instrument

³ Per NST Technical Note 1297, 1994 Edition, Section D.1.1.2, definition of "repeatability [of results of measurements]"

⁴ Defined as laser launch power minus detection noise floor

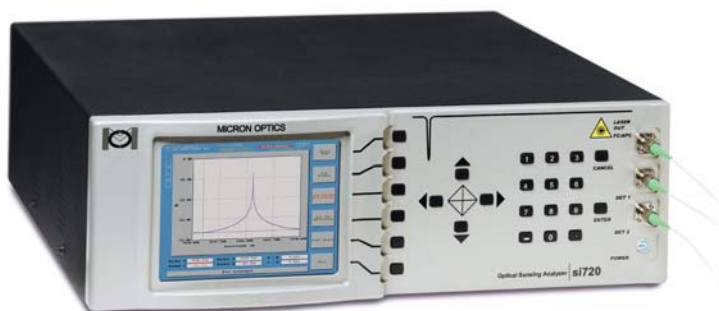
⁵ USB memory operating conditions may differ from sm125 specifications

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
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Description

The si720 is a high power, high accuracy, high resolution complement to the Micron optics si425. It provides higher accuracy and resolution than the si425 and can be used for a wide variety of optical sensors. The system provides users with a complete understanding of how the spectral shape of the sensor reacts to varying physical conditions – rather than only reporting shifts in central wavelengths from FBGs. This instrument is used both as the first step in the development of high volume custom sensing systems and in long term field measurements.

The self-contained system is composed of:

- An extremely low-noise fibre ring laser
- A NIST-traceable absolute optical reference
- Fast analog-to-digital conversion
- Proprietary RT-Linux based software
- Two detectors enabling the measurement of sensors in transmission and reflection
- Built-in single board computer, display and instrument control panel

Two sensor channels allow simultaneous interrogation of sensors on two fibres. Either channels can be used to interrogate gratings in transmission or reflection and the system can be adopted to many types of sensors. The wavelength is automatically calibrated with each scan in less than 200 ms.

The laser is continuously swept across a 50 nm spectrum at a rate of 5.0 or 0.5 Hz. All data can be transferred to an external PC via GPIB.

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B-2440 Geel
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Features

- Useful in the design and selection of optical sensors and high-volume sensor interrogation systems.
- High accuracy, resolution and full profile data provide comprehensive feedback on sensor capabilities
- LabVIEW™ peak detection utility provides high resolution, high accuracy Bragg grating center wavelength measurements
- Whole spectrum measurement aids in understanding how sensors' characteristics change under various physical conditions
- Useful for analysis of a wide variety of passive optical sensors –FBGs, Fabry-Perot sensors, Long period Gratings, etc.

Standard specifications

Optical	
Number of optical channels	2
Maximum number of FBG Sensors/Channels	Full Spectrum
Wavelength Range	1520 to 1570 nm
Resolution ¹	0.25 pm
Dynamic Range	> 60 dB
Scan Frequency (user selectable)	5 Hz or 0.5 Hz
Typical FBG Spacing	~ 2 x Sensor Bandwidth
Optical Connectors	FC/APC
Electrical & Mechanical	
Power (user selectable)	110 or 220 VAC
Power consumption	150W Maximum
Interface	GPIO
Mechanical	
Operating Temperature	0° to 50°C
Storage Temperature	-5° to 55°C
Dimensions	133 x 432 x 451 mm
Color LCD Display	162 mm (diagonal)
Options	
GPIO Tool Kit	PCMCIA GPIO Card and Cable, LabVIEW™ peak-finding utility software (runtime only)
Printer for Screen Capture	160 x 164 x 59 mm

¹ 0.25 pm resolution achieved via fitting routines and averaging

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B-2440 Geel
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Description

The Micron Optics si425 is a complete, stand-alone, multi-sensor measurement system that provides a high optical power, rapid measurement rate up to 512 FBGs on four fibres. The si425 has been designed with an advanced laser capable of a maximum scan rate of 250 Hz and is expandable from 1 to 4 DUT channels. The user can choose scan frequencies from 1 to 250 Hz at fixed increments.

Four standard screen views are available either through the build-in LCD or via Ethernet on a remote PC.

- Sensor Wavelength View: shows λ vs. Time for selected sensors.
- Table View: simultaneously displays λ for all sensors on all channels.
- Channel Power View: sets gain level for each channel.
- FFT View: Clearly and accurately identifies the fundamental frequency of oscillations.

Features

- Stand-alone instrument that can simultaneously monitor up to 512 sensors.
- Resolution 1pm, fast scanning at 250Hz, repeatability of 2pm.
- Standard Ethernet port provides easy data access and remote control.
- Built-in, single-board computer with color display
- Rack mountable
- Three standard configurations with customizable, modular feature sets.

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T +32 14 58 11 91
F +32 14 59 15 14
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Standard specifications

Optical	200	500
	Preliminary	
Number of optical channels	1	4
Maximum number of FBG Sensors/ Channels	32	128
Wavelength Range	1520 to 1570 nm	1520 to 1570 nm
Resolution ¹	0.2 pm	0.2 pm
Repeatability	2 pm (~ 1.7 $\mu\epsilon$ typ, 5 pm max)	
Typical Grating Configuration	Apodized, reflectivity > 90%, BW < 0.25 nm	
Dynamic Range	15 dB	25 dB
Scan Frequency ²	50 Hz	250 Hz
Optical Connectors	FC/APC	FC/APC
Electrical & Mechanical		
Power Supply	24 VDC, 110/220 VAC	
External Data Access Interface	Ethernet	Ethernet
Color LCD Display	No	Yes
Operating Temperature	10° to 40° C	10° to 40° C
Dimensions	133 x 432 x 451 mm	133 x 432 x 451 mm

¹ Resolution achieved via averaging

² 125 Hz for > 100 sensors

Options

sm040-416 (16 ch. Switch Extension): 1 U box converting 4 optical channel I/O from si425-500 instrument to 16 optical channel I/O for sensor arrays. Product pricing includes all necessary jumpers, standard 110V/220V operation, control software and Ethernet command set providing access through LabVIEW™.

sm040-408 (8 ch. Switch Extension): 1 U box converting 4 optical channel I/O from si425-500 instrument to 8 optical channel I/O for sensor arrays.

sm040-016 (16 ch Coupler Extension): This 1U chassis contains four 1x4 couplers to accommodate connection of up to four fibres per channel. All fibres are scanned simultaneously. This provides no net gain of wavelength range or sensor capacity. It is solely intended to provide more fibre connection options.

sm040-008 (8 ch. Coupler Extension): This 1 U chassis contains four 1x2 couplers to accommodate connection of up to two fibres per channel.

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Fibre Optics Brillouin Analyzer DiTeSt, STA200



Description

The DiTeSt analyzer is a fibre optics and laser-based monitoring system using an optical interaction measurement principle : Stimulated Brillouin Scattering (SBS).

SBS is an intrinsic physical property of the fibre material and provides important information about the strain and temperature distribution experienced by an optical fibre. Standard or special single-mode telecommunication fibres and cables can be used as sensing element. The local SBS characteristics are measured thanks to an innovative and highly reliable configuration.

This proprietary technique uses a single laser source and requires access to only one fibre end. It is totally self-referenced allowing periodic measurements without any preliminary calibration. Multiple sensing fibres can be connected to the instrument and monitored automatically through an internal optical switch.

The built-in computer incorporates a user friendly graphical User interface (GUI) and a touch screen display, which makes the menus extremely easy to be accessed. The instrument can be configured for long term automatic unattended measurements.

The measurements are recorded automatically and stored in a database and can easily be retrieved at any time for further analysis. The database is accessible from remote computers through a LAN network.

Features

- Distributed measurement of strain and temperature
- Strain sensitivity: 20 $\mu\epsilon$ (0.002%)
- Temperature sensitivity: 1°C
- High spatial resolution
- Extended range up to 30 Km
- Long-term stability



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www.fos-s.be

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Fibre Optics Brillouin Analyzer DiTeSt, STA200

Standard specifications

Performance	
Measurement range	Up to 30 km
Distance resolution	0.1 m
Spatial resolution ¹	1m over 10km 2m over 20km 4m over 30km
Strain range	-1,25 to +1,25% (typical)
Temperature range	- 270°C to + 500°C
Strain accuracy	20 µε (0.002%, 0.02 mm/m)
Temperature accuracy	1°C
Strain resolution	+/- 2 µε (0.0002%, 0.002 mm/m)
Temperature resolution	+/- 0.1 °C
Sampling points	Max. 50'000 points
Averaging	1 to 10000
Acquisition time	20 sec to 5 min (2 min typical)
Technical data	
Optical connector	FC-APC (E-2000 on demand)
Laser wavelength	1.55 µm band (Class 1 type)
Channels	2 (standard) up to 60 channels (upon request)
Operating Temperature	0°C to 40°C
Power supply	115/230 VAC
Power requirements	< 400 W
Dimensions (W x D x H)	449 x 500 x 266 mm (19" rack)
Weight	< 20 kg
Features	
Measurement features	Temperature distribution Strain distribution
Measurement modes	Manual or automatic unattended measurements
Data Analysis	Measurement analysis, Multiple traces comparison with respect to selectable baseline, Measurement trends, graphical zoom, ...
Alarm & Warnings	Automatic alarm triggering, configurable types of alarms (heat, strain, leakage,...)
Graphical Interface	SVGA 12" colour screen
Remote operation	Remote control, configuration and maintenance
Connections	USB, Ethernet
Data storage	Internal Hard disc (20 GB or more)
Data format	Dedicated database compatible with SDB standards, text files, MS Excel, ...
Output signals	software alarms via LAN, internet, ... Output relays SPST or SSR (upon request)
Compensations	Automatic self compensation of all instrumental and environmental drifts
Diagnostic	Long term operation 24/7 guaranteed by automatic recovery and continuous self diagnostic.

¹ The spatial resolution defines the smallest detectable event along the optical fibre and may depend on fibre type and installation.



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Fiber Optic Sensors
and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Temperature Probe TP-01



Description

The fibre optic temperature probe TP-01 makes use of the inherent temperature sensitivity of the Fibre Bragg Grating. The FBG is positioned in the outer end of a stainless steel capillary with a diameter of 2,3 mm. The capillary is terminated with an optical connector. Capillary, connector and pigtail lengths can be specified following the needs of every application.

Features

The temperature probe TP-01 can measure temperatures with a resolution of 0.1 °C and an accuracy of 1°C. The sensor can be used in harsh environments and is pressure tight up to 150 bar.

Applications

Pipeline monitoring, process control, ...

Standard specifications

Parameter	Unit	Value
Temperature resolution	°C	0,1
Temperature accuracy	°C	1°C
Temperature range ¹	°C	0 to 85
Capillary diameter	mm	2,3
Capillary length ²	cm	5 - 100
Pigtail diameter	mm	φ2
Pigtail length	m	On request
FBG central wavelength	nm	1530 to 1570 nm
Connector type	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

² Other lengths on request

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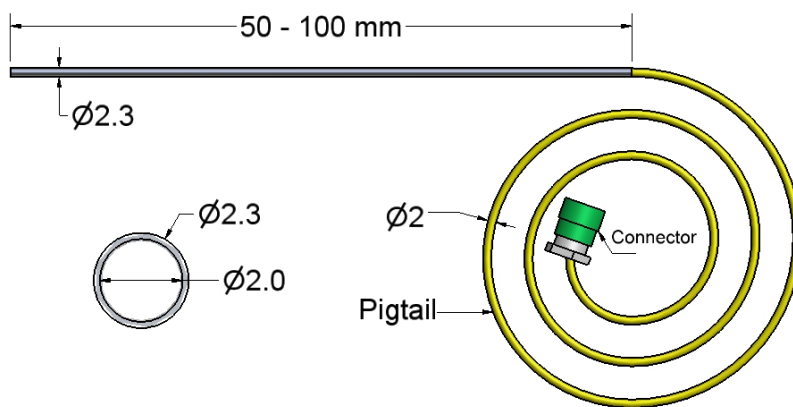
Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Temperature Probe TP-01

Technical drawing (in mm)



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and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm .

Released: April, 2006

Temperature Probe TP-02



Description

The fibre optic temperature probe TP-02 is a high resolution temperature sensor. The sensor makes use of the inherent temperature sensitivity of the Fibre Bragg Grating as well as the thermal expansion of its housing. The packaged FBG is positioned inside a stainless steel tube with a diameter of 6 mm and is terminated with an optical connector. Pigtail length and connector can be specified following the needs of every application.

Features

The temperature probe TP-02 can measure temperatures with a resolution of 0.04 °C and an accuracy of 0,4°C. The sensor can be used in harsh environments and is pressure tight up to 150 bar.

The sensor can also be connectorised at both ends to make series configurations possible.

There is also the possibility to foresee an integrated adapter at both sides of the temperature probe.

Applications

Pipeline monitoring, process control, ...

Standard specifications

Parameter	Unit	Value
Temperature resolution	°C	0,04
Temperature accuracy	°C	0,4
Temperature range ¹	°C	0 to 85
Diameter stainless steel tube	mm	6
Pigtail diameter	mm	φ0,9 ; φ2 ; φ3
Pigtail length	cm	On request
FBG central wavelength	nm	1530 to 1570
Connector type ²	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

² An integrated adapter is also possible

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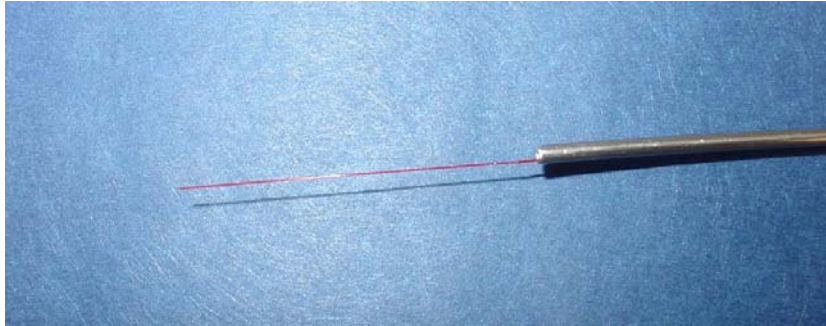
Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

Temperature chain TC-01



Description

The fibre optic temperature chain TC-01 makes use of the inherent temperature sensitivity of the Fibre Bragg Grating. The chain consists of a fibre containing different FBGs. The fibre with the FBGs are inserted into a stainless steel capillary with a diameter of 3 mm. The capillary is filled with a special gel which keeps the fibre in a loose tube configuration. This loose tube configuration maintains the fibre stress free over the complete operating conditions. The cable is terminated with an optical connector. Capillary length, number of sensing points and the spatial distribution of the sensing points can be specified following the needs of every application.

Features

The temperature chain TC-01 can measure distributed temperatures with a resolution of 0.1 °C and an accuracy of 2°C. The maximum temperature range is 85°C but can optionally be extended up to 180°C.

Applications

The temperature chain can be applied for distributed temperature monitoring in boreholes, pipelines, concrete structures, tunnels (fire detection), ...

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Temperature chain TC-01

Standard specifications

Parameter	Unit	Value	
Temperature resolution	°C	0,1	
Temperature accuracy	°C	2	
Temperature range ¹	°C	0 to 85	
FBG central wavelength	mm	1530 to 1570 nm	
Pigtail diameter	mm	2	
Pigtail length	-	On request	
Connector type	-	FC/PC, FC/APC	
Process/ material			
		Thick-ness	Outer diam.
Optical fibres, SM (9/125µm) , max 4 off	mm	-	0.25
Steel tube (AISI 304) with filling material and optical fibres	mm	0.20	3.0
Polymer Sheath (Optional)	mm	0.20 - 2.5	3.4 – 8.0
Physical Characteristics			
Outer diameter	mm	3.0	
Weight in air (approximately)	kg/km	18	
Minimum bending diameter, 1 cycle	mm	120	
Minimum repeated bending diameter	mm	200	
Safe working load	N	500	
Breaking load	N	>1750	
Axial Stiffness (E=196GPa, A=0.636mm ²)	kN	345	
Yield Strength	MPa	900	
Fibre slack within steel tube	%	0.25 – 0.35	
Optical characteristics			
Optical attenuation @ 1550 nm (max)	dB/km	Depends on Fibre	
Chromatic dispersion @ 1550 nm (max)	ps/nm·km		
Remarks			
<ul style="list-style-type: none"> • Maximum fibre excess length in tube is dependant on number of fibres. • The excess length is determined on basis of temperature region and tube configuration in application. • The polymer material for the sheath will be selected according to environmental conditions. 			

¹ Extended temperature range possible on request

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

Temperature chain TC-03

Description

The fibre optic temperature chain TC-03 makes use of the inherent temperature sensitivity of the Fibre Bragg grating. The chain consists of a fibre containing different FBGs. The fibre with the FBGs is reinforced using carbon wires in the longitudinal directions which are fixed to the optical fibre using an epoxy resin. These give an excellent longitudinal stress protection to the fibre while keeping weight and diameter very small. The cable is terminated with an optical connector. Cable length, number of sensing points and the spatial distribution of the sensing points can be specified following the needs of every application.

Features

The temperature chain TC-03 can measure distributed temperatures with a resolution of 0.1 °C and an accuracy of 1°C. The chain length can go up to several km. The maximum temperature range is 85°C but can optionally be extended up to 150°C.

Applications

The temperature chain can be applied for distributed temperature monitoring in boreholes, pipelines, concrete structures, tunnels (fire detection), ...

Standard specifications

Parameter	Unit	Value
Temperature resolution	°C	0,1
Temperature accuracy	°C	1°C
Temperature range ¹	°C	0 to 85
Cable diameter	mm	1,5
Maximum length ²	km	1
Young modulus	GPa	+/- 125
Weight density	g/cm ³	1,5 – 1,6
FBG central wavelength	nm	1530 to 1570 nm
Connector type	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

² For larger lengths, different cables will be connected in series

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

Mountable strain sensor MS-01

Description

The mountable strain sensor MS-01 is a high strength coated FBG that can be glued directly on a structure for strain sensing without coating removal. The sensor is foreseen of a protective coating and connector for signal transmission.

Features

The mountable strain sensor MS-01 can record strain effects with a resolution of $1 \mu\epsilon$, accuracy of $10 \mu\epsilon$ and a range up to 4%. The sensor is also sensitive to temperature changes 1°C corresponds to $8 \mu\epsilon$. In order to compensate for these influences a second FBG that will not be fixed on the structure can be used to compensate for these effects.

Applications

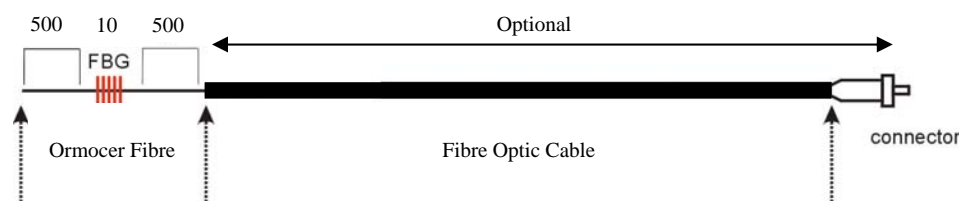
Concrete Health monitoring, Strain monitoring in composite structures, strain monitoring on reinforcement steel bars, vibration monitoring,...

Standard specifications

Parameter	Unit	Value
Strain resolution	$\mu\epsilon$	1
Strain accuracy	$\mu\epsilon$	10
Temperature cross sensitivity	$\mu\epsilon / ^\circ\text{C}$	8
Temperature range	$^\circ\text{C}$	-20 to 180
Core Diameter	μm	4
Bare fibre diameter	μm	125 +/- 1
Coated fibre diameter	μm	235
FBG-Central wavelength ¹	nm	1530 to 1560 in steps of 5nm
Attenuation (at 1550nm)	dB/km	12
Tensile Strength (at break)	N	> 50
Coating Material		Ormocer
Optional pigtail		
Fibre optic Cable diameter	mm	$\phi 0,9$; $\phi 2$; $\phi 3$
Fibre Optic Cable Length	m	1-20
Connector	-	FC/PC, FC/APC

¹ Other wavelengths available on request

Technical drawing (in mm)



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

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Mountable strain sensor MS-01



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm .

Released: April, 2006

Mountable Strain Sensor MS-02



Description

The mountable strain sensor MS-02 makes use of the internal strain sensitivity of the FBG. The FBG is fixed inside a ruggedised stainless steel housing between two anchoring points. The housing is foreseen of a sliding mechanism that allows both ends to move freely relative to each other. An adjustable screw mechanism is foreseen in order to reset the sensor when it becomes out of range.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the housing.

The housing consists of stainless steel and is terminated with an optical connector. Pigtail lengths and connector can be specified following the needs of every application.

The sensor can also be connectorised at both ends to make series configurations possible.

Features

The mountable strain sensor MS-02 can measure displacements and temperature with a resolution of 0,065 μm and 0,04 $^{\circ}\text{C}$ respectively and an accuracy of 0,65 μm and 0,4 $^{\circ}\text{C}$ respectively. The total displacement range is 520 μm .

Applications

The mountable strain sensor MS-02 can be applied for measuring small displacements, cracking or fissurisation of walls and structures,...

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

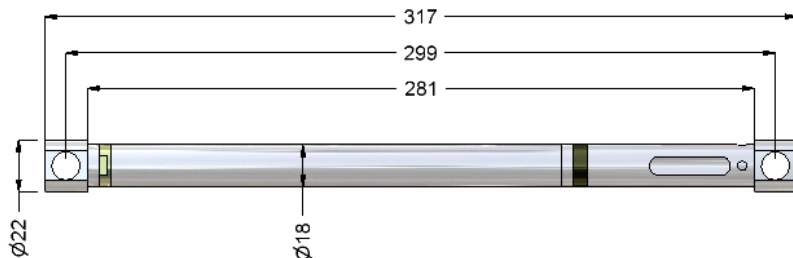
Mountable Strain Sensor MS-02

Standard specifications

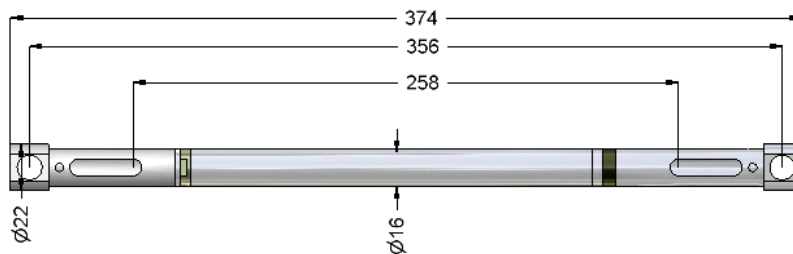
Parameter	Unit	Value
Displacement range	μm	520
Displacement Resolution	μm	0,065
Displacement Accuracy	μm	0,65
Temperature resolution	$^{\circ}\text{C}$	0,04
Temperature accuracy	$^{\circ}\text{C}$	0,4
Temperature range ¹	$^{\circ}\text{C}$	0 - 85
Pigtail diameter	mm	$\phi 2$, $\phi 3$
Pigtail length	cm	On request
Connector type	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

Technical drawing single connector (in mm)



Technical drawing series configuration (in mm)



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Cipalstraat 14
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Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm .

Released: April, 2006

Mountable Strain Sensor MS-03



Description

The mountable strain sensor MS-03 makes use of the internal strain sensitivity of the FBG. The FBG is fixed inside a ruggedised stainless steel housing between two anchoring points. The housing is foreseen of a sliding mechanism that allows both ends to move freely relative to each other.

The sensor can be mounted on a structure using the two anchoring pieces, wherein the sensor can be fixed. The sensor is configured such that the distance between both anchoring pieces can be varied between 145 and 190 mm in order to make the strain range and strain resolution variable.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the housing.

The housing consists of stainless steel and is terminated with an optical connector or an integrated optical adapter. Pigtail lengths and connector can be specified following the needs of every application.

The sensor can also be connectorised at both ends to make series configurations possible.

Features

The mountable strain sensor MS-03 can measure displacements and temperature with a resolution of 0,092 μm and 0,04 $^{\circ}\text{C}$ respectively and an accuracy of 0,92 μm and 0,4 $^{\circ}\text{C}$ respectively. The total displacement range is 550 μm .

Applications

The mountable strain sensor MS-03 can be applied for measuring small displacements, cracking or fissurisation of walls and structures.

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

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Mountable Strain Sensor MS-03

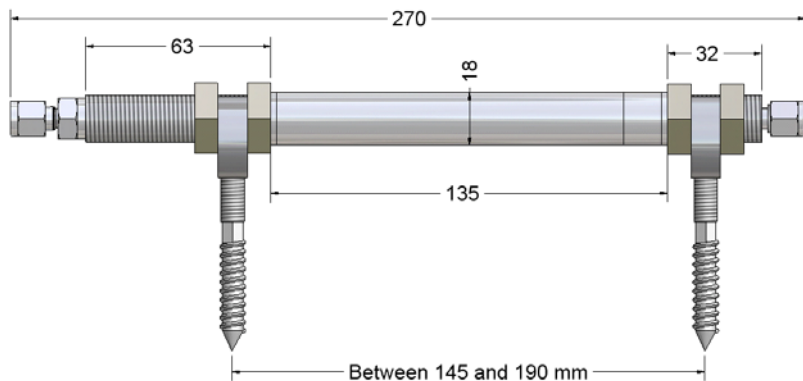
Standard specifications

Parameter	Unit	Value
Displacement range	μm	550
Displacement Resolution	μm	0,092
Displacement Accuracy	μm	0,92
Temperature resolution	$^{\circ}\text{C}$	0,04
Temperature accuracy	$^{\circ}\text{C}$	0,4
Temperature range ¹	$^{\circ}\text{C}$	0 - 85
Pigtail diameter	mm	$\phi 2$, $\phi 3$
Pigtail length	cm	On request
Connector type ²	-	FC/PC, FC/APC
Minimum fixation distance	mm	145
Maximum fixation distance	mm	190
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

² An integrated adapter is also possible

Technical drawing series configuration (in mm)



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Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm .

Released: April, 2006

Mountable Strain Sensor MS-05



Description

The mountable strain sensor MS-05 makes use of the internal strain sensitivity of the FBG. The FBG is prestrained inside a ruggedised housing between two anchoring points, which makes it possible to measure both extension and compression.

The sensor can be mounted on a structure using the two anchoring pieces. This can be done using bolts or the sensor can be welded directly on the structure. The sensor is configured so that the distance between both anchoring pieces will be only 80 mm.

The sensor will be connectorised at both ends to make series configurations possible. Pigtail lengths and connector can be specified following the needs of every application. In series configuration the strain sensor is not temperature compensated. The single configuration can be temperature compensated (optional).

Features

The mountable strain sensor MS-05 can measure displacements with a resolution of $1 \mu\epsilon$ and an accuracy of $10 \mu\epsilon$. The total displacement range is $5000 \mu\epsilon$.

The mountable strain sensor in single configuration that is temperature compensated, can measure temperature with a resolution of $0,1 \text{ }^\circ\text{C}$ and an accuracy of $1 \text{ }^\circ\text{C}$.

Applications

The mountable strain sensor MS-05 can be applied for measuring small displacements, cracking or fissurisation of walls and structures.

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Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
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Released: April, 2006

Mountable Strain Sensor MS-05

Standard specifications

Parameter	Unit	Value
Strain resolution	$\mu\epsilon$	1
Strain Accuracy	$\mu\epsilon$	10
Strain Range	$\mu\epsilon$	5000
Pigtail diameter	mm	$\phi 2$, $\phi 3$
Pigtail length	cm	On request
Connector type ¹	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Dimensions	mm	$\emptyset 17 \times 70$
Optional: Temperature compensation²		
Temperature resolution	$^{\circ}\text{C}$	0,1
Temperature accuracy	$^{\circ}\text{C}$	1
Temperature range	$^{\circ}\text{C}$	0 - 85

¹ An integrated adapter is also possible

² Only possible with single configuration

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

Embeddable Strain Sensor ES-01



Description

The embeddable strain sensor ES-01 makes use of the internal strain sensitivity of the FBG. The FBG is prestrained inside a ruggedised housing between two anchoring points, which makes it possible to measure both extension and compression.

The sensor can be applied in different ways: embedded into a structure, fixated using bolts or welded directly on the structure. The sensor is configured so that the distance between both anchoring pieces will be 70 mm.

The sensor can be connectorised at both ends to make series configurations possible. Pigtail lengths and connector can be specified following the needs of every application. In series configuration the strain sensor is not temperature compensated. The single configuration can be temperature compensated (optional).

Features

The embeddable strain sensor ES-01 can measure displacements with a resolution of $1 \mu\epsilon$ and an accuracy of $10 \mu\epsilon$. The total displacement range is $5000 \mu\epsilon$.

The embeddable strain sensor in single configuration that is temperature compensated, can measure temperature with a resolution of $0,1 \text{ }^\circ\text{C}$ and an accuracy of $1 \text{ }^\circ\text{C}$.

Applications

Concrete health monitoring, strain monitoring in composite structures, strain monitoring on reinforcement steel bars, vibration monitoring,...

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and Sensing systems

Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Embeddable Strain Sensor ES-01

Standard specifications

Parameter	Unit	Value
Strain resolution	$\mu\epsilon$	1
Strain Accuracy	$\mu\epsilon$	10
Strain Range	$\mu\epsilon$	5000
Pigtail diameter	mm	$\phi 2$, $\phi 3$
Pigtail length	cm	On request
Connector type ¹	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Dimensions ²	mm	$\varnothing 17 \times 70$
Optional: Temperature compensation³		
Temperature resolution	$^{\circ}\text{C}$	0,1
Temperature accuracy	$^{\circ}\text{C}$	1
Temperature range	$^{\circ}\text{C}$	0 - 85

¹ An integrated adapter is also possible

² Outer diameter can be decreased on request

³ Only possible with single configuration

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm .

Released: April, 2006

Description

The fibre optic strain chain SC-01 makes use of the inherent strain sensitivity of the Fibre Bragg Grating. The chain consists of a fibre containing different FBGs. The fibre with the FBGs is reinforced using carbon wires in the longitudinal directions which are fixed to the optical fibre using an epoxy resin. These give an excellent protection to the fibre while keeping weight and diameter very small. The cable can be used to measure strain (or displacement) between different anchoring points. The cable is terminated with an optical connector. Cable length, number of sensing points and the spatial distribution of the sensing points can be specified following the needs of every application.

Features

The strain chain SC-01 can measure distributed strain with a resolution of 1 $\mu\epsilon$ and an accuracy of 10 $\mu\epsilon$. The sensor is also sensitive to temperature changes: 1°C corresponds to 8 $\mu\epsilon$. In order to compensate for these influences a second FBG that will not be strained can be used to compensate for these effects.

Applications

The strain chain can be applied for distributed strain monitoring in boreholes, pipelines, concrete structures, tunnels (fire detection), ...

Standard specifications

Parameter	Unit	Value
Strain resolution	$\mu\epsilon$	1
Strain accuracy	$\mu\epsilon$	10
Strain range	$\mu\epsilon$	2500
Temperature range ¹	°C	0 to 85
Cable diameter	mm	1,5
Temperature cross sensitivity	$\mu\epsilon/^\circ\text{C}$	8
Maximum length ²	km	1
Young modulus	GPa	+/- 125
Weight density	g/cm^3	1,5 – 1,6
FBG central wavelength	nm	1530 to 1570 nm
Connector type	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

² For larger lengths, different cables will be connected in series

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Description

The fibre optic strain chain SC-02 makes use of the inherent strain sensitivity of the Fibre Bragg Grating. The chain consists of a fibre containing different FBGs. The fibre with the FBGs is protected with a 900 µm jacketing which at his turn is surrounded with a stainless steel helix protection. This gives an excellent protection to the fibre while keeping weight and diameter very small. The cable can be used to measure strain (or displacement) between different anchoring points. The cable is terminated with an optical connector. Cable length, number of sensing points and the spatial distribution of the sensing points can be specified following the needs of every application.

Features

The strain chain SC-02 can measure distributed strain with a resolution of 1 µε and an accuracy of 10 µε. The sensor is also sensitive to temperature changes: 1°C corresponds to 8 µε. In order to compensate for these influences a second FBG that will not be strained can be used to compensate for these effects.

Applications

The strain chain can be applied for distributed strain monitoring in boreholes, pipelines, concrete structures, tunnels, ...

Standard specifications

Parameter	Unit	Value
Strain resolution	µε	1
Strain accuracy	µε	10
Strain range	µε	10000
Temperature range ¹	°C	0 to 85
Cable diameter	mm	<3
Temperature cross sensitivity	µε/°C	8
Maximum length ²	km	1
FBG central wavelength	nm	1530 to 1570 nm
Connector type	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

² For larger lengths, different cables will be connected in series

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Displacement sensor D-01



Description

The displacement sensor D-01 makes use of the internal strain sensitivity of the FBG. The FBG is fixed inside a ruggedised stainless steel housing between two anchoring points. The housing is foreseen of a sliding mechanism that allows both ends to move freely relative to each other and an integrated spring mechanism that allows to slide over large distances without overstressing the FBG. In order to compensate for temperature influences, a high resolution temperature probe is integrated within the housing.

The housing is made of stainless steel and is terminated with an optical connector or an integrated optical adapter. Pigtail lengths and connector can be specified following the needs of every application.

Features

The displacement sensor D-01 can measure displacement and temperature with a resolution of 0,05% Full Scale and 0,1 °C respectively and an accuracy of 1% Full Scale and 1 °C respectively. The displacement range can be chosen between 1 and 8 cm.

Applications

The displacement sensor D-01 can be applied for positioning measurements. The sensor can also be used with special packers in bore holes to determine geological settlements or can be surface mounted to detect movements between the anchoring points.

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Fiber Optic Sensors
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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Displacement sensor D-01

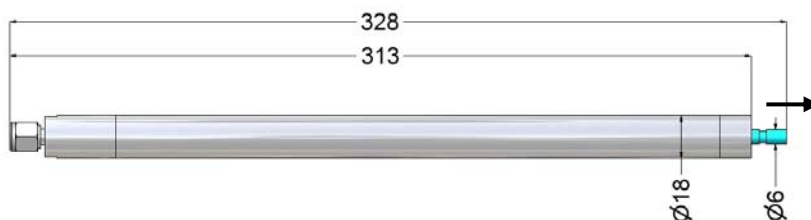
Standard specifications

Parameter	Unit	Value
Displacement range	mm	10-80
Displacement resolution	mm	0,05% FS
Displacement accuracy	mm	1% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Pigtail diameter	mm	φ2 , φ3
Pigtail length	Cm	On request
Connector type ²	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

² An integrated adapter is also possible

Technical drawing (in mm)



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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm.

Released: April, 2006

Displacement sensor D-02



Description

The displacement sensor D-02 makes use of the internal strain sensitivity of the FBG. The FBG is fixed inside a ruggedised stainless steel housing between two anchoring points. One of the anchoring points is connected to a sliding pin mechanism that can be moved to the inward direction. A spring mechanism assures that the sliding pin comes back to the outward direction when no small force is acting on it. Any movement of the pin is recorded by the FBG .

In order to compensate for temperature influences, a FBG based temperature probe is integrated within the housing.

The housing consists of stainless steel and is terminated with an optical connector or an integrated adapter. Pigtail lengths and connector can be specified following the needs of every application.

Features

The displacement sensor D-02 can measure displacement and temperature with a resolution of 0,05% Full Scale and 0,1 °C respectively and an accuracy of 0,5% Full Scale and 1 °C respectively. The displacement range can be chosen between 1 and 5 cm.

Applications

The displacement sensor D-02 can be applied for positioning measurements. The sensor can also be used with special packers in bore holes to determine geological settlements or can be surface mounted to detect movements between the anchoring points.

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
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Released: April, 2006

Displacement sensor D-02

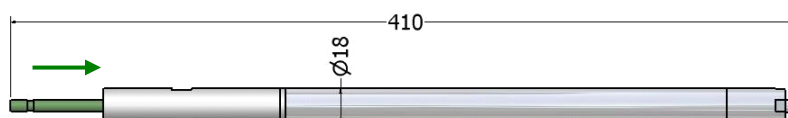
Standard specifications

Parameter	Unit	Value
Displacement range	mm	10-50
Displacement resolution	mm	0,05% FS
Displacement accuracy	mm	0,5% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Maximum pull in Force	N	20
Pigtail diameter	mm	φ2 , φ3
Pigtail length	cm	On request
Connector type ²	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

² An integrated adapter is also possible

Technical drawing (in mm)



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

Pressure sensor P-01



Description

The fibre optic pressure sensor P-01 consists of a membrane that is connected to a FBG mounted under pre-strain. When pressure is applied to the membrane, the membrane will deflect resulting into a change in the FBG strain value and hence also in a change of the reflected FBG wavelength.

The head of the pressure sensor is foreseen of a thread that allows connecting the sensor to pipelines, valves and vessels.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the housing.

The housing is made of stainless steel and is terminated with an optical connector using a plastic tubing. Tubing lengths and connector can be specified following the needs of every application.

The sensor is single connectorised but can on request also be designed for series configurations.

Features

The pressure sensor P-01 can measure pressure and temperature with a resolution of 0,05% Full Scale and 0,1 °C respectively and an accuracy of 1% Full Scale and 1 °C respectively. The pressure range can be chosen between 1 and 150 bar.

Applications

The pressure sensor can be applied for flow control in all sorts of pipelines and liquid level measurements in reservoirs and others.

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Belgium

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F +32 14 59 15 14
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Released: April, 2006

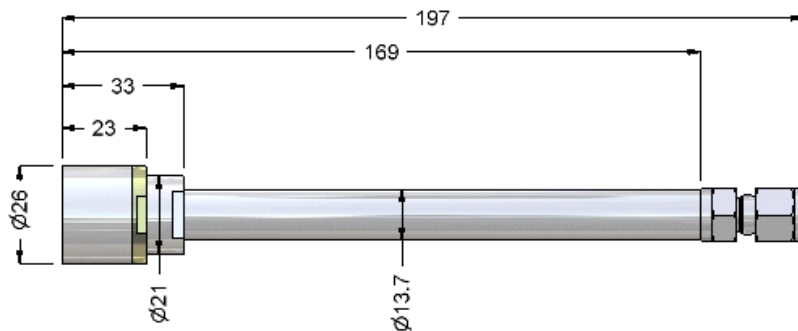
Pressure sensor P-01

Standard specifications

Parameter	Unit	Value
Pressure range	bar	1-150
Pressure Resolution	bar	0,05% FS
Pressure accuracy	bar	1% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Thread	-	M 18 x 1,0
Tube diameter	mm	4 or 6
Tube length	cm	On request
Connector type	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

Technical drawing (in mm)



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μ m and a relative wavelength accuracy better than 10 μ m.

Released: April, 2006

Pore water pressure sensor PWP-01



Description

The fibre optic pore water pressure PWP-01 sensor consists of a membrane that is connected to a FBG mounted under pre-strain. When pressure is applied to the membrane, the membrane will deflect resulting into a change in the FBG strain value and hence also in a change of the reflected FBG wavelength.

The head of the pore water pressure sensor is foreseen of a flat porous stone that allows water penetration.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the ruggedised housing.

The housing is made of stainless steel and is terminated with an optical connector using a plastic tubing. Tubing lengths and connector can be specified following the needs of every application. The sensor is single connectorised but can on request also be designed for series configurations.

Features

The pressure sensor PWP-01 can measure water pressure and temperature with a resolution of 0,05% Full Scale and 0,1 °C respectively and an accuracy of 1% Full Scale and 1 °C respectively. The pressure range can be chosen between 1 and 150 bar.

Applications

The pressure sensor PWP-01 can be applied for pressure measurements into boreholes. Other applications are level measurements in liquid reservoirs, dams, ...

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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
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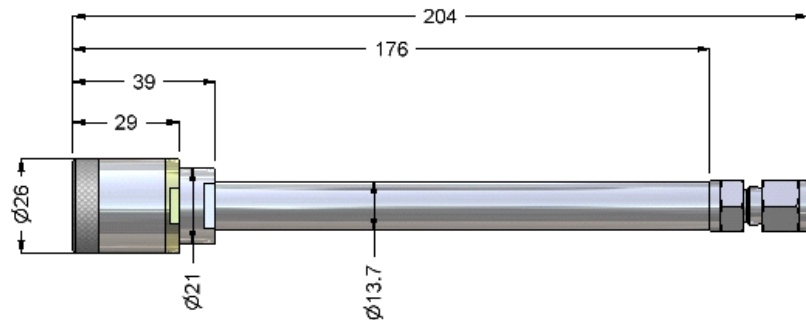
Pore water pressure sensor PWP-01

Standard specifications

Parameter	Unit	Value
Pressure range	bar	1-150
Pressure Resolution	bar	0,05% FS
Pressure accuracy	bar	1% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Tube diameter	mm	4 or 6
Tube length	cm	On request
Connector type	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

Technical drawing (in mm)



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μ m and a relative wavelength accuracy better than 10 μ m.

Released: April, 2006

Pore water pressure sensor PWP-02



Description

The fibre optic pore water pressure sensor PWP-02 consists of a membrane that is connected to a FBG mounted under pre-strain. When pressure is applied to the membrane, the membrane will deflect resulting into a change in the FBG strain value and hence also in a change of the reflected FBG wavelength.

The head of the pore water pressure sensor is foreseen of a cylindrical porous stone that allows water penetration. Dependent on the application, this stone can be flat or cylindrical.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the ruggedised housing.

The housing is made of stainless steel and is terminated with an optical connector using a plastic tubing. Tubing lengths and connector can be specified following the needs of every application. The sensor is single connectorised but can on request also be designed for series configurations.

Features

The pressure sensor PWP-02 can measure water pressure and temperature with a resolution of 0,05% Full Scale and 0,1 °C respectively and an accuracy of 1% Full Scale and 1 °C respectively. The pressure range can be chosen between 1 and 150 bar.

Applications

The pressure sensor PWP-02 can be applied for embedded pressure measurements in structures consisting of bentonite, clay, concrete,...

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Belgium

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F +32 14 59 15 14
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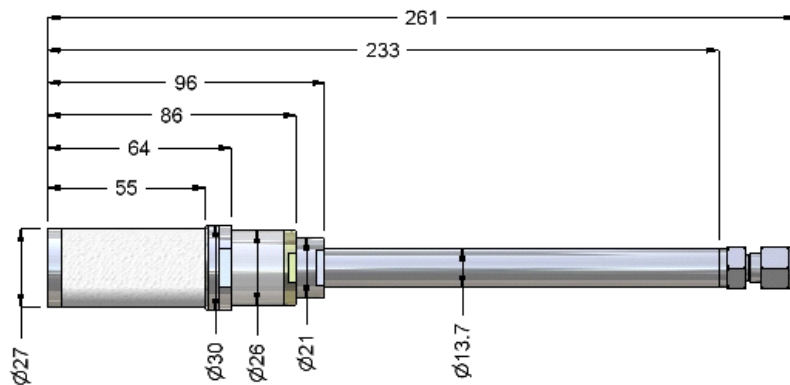
Pore water pressure sensor PWP-02

Standard specifications

Parameter	Unit	Value
Pressure range	bar	1-150
Pressure Resolution	bar	0,05% FS
Pressure accuracy	bar	1% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Tube diameter	mm	4 or 6
Tube length	cm	On request
Connector type	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

Technical drawing (in mm)



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
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www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μ m and a relative wavelength accuracy better than 10 μ m.

Released: April, 2006

Load cell LC-01



Description

The load cell LC-01 consists of a pressure sensor with thread coupling (see separate data sheet) connected to a special oil filled path. When this path will be affected by load levels, the oil inside will be pressurised. This pressure is recorded by the membrane of the pressure sensor.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the housing.

The housing is made of stainless steel and is terminated with an optical connector using a plastic tubing. Tubing lengths and connector can be specified following the needs of every application. The sensor is single connectorised but can on request also be designed for series configurations.

Features

The load cell LC-01 can measure load levels and temperature with a resolution of 0,05% Full Scale and 0,1 °C respectively and an accuracy of 1% Full Scale and 1 °C respectively. The load level can be chosen between 1 and 150 bar.

Applications

The load cell LC-01 can be applied to measure load, earth an soil pressure as well as concrete stress.

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

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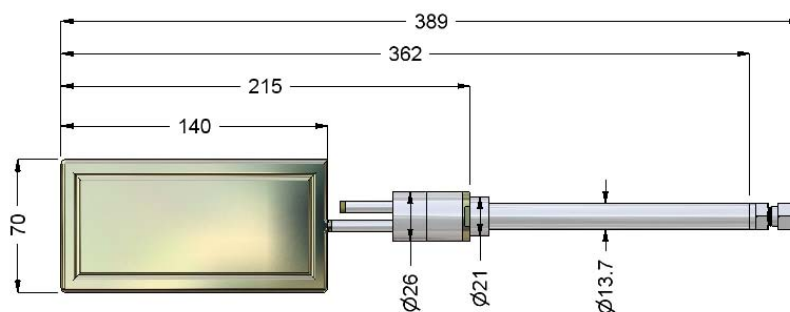
Load cell LC-01

Standard specifications

Parameter	Unit	Value
Load range	bar	1-150
Load Resolution	bar	0,05% FS
Load accuracy	bar	1% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Tube diameter	mm	4 or 6
Tube length	cm	On request
Connector type	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

Technical drawing (in mm)



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μ m and a relative wavelength accuracy better than 10 μ m.

Released: April, 2006

Humidity sensor HS-01



Description

The fibre optic humidity sensor HS-01 makes use of a humidity sensitive element that is connected to a FBG. The humidity element shows a very strong swelling effect when humidity reaches 80%. Due to the swelling, the FBG will be strained resulting into a wavelength shift of the FBG. The complete system is mounted within a ruggedised housing foreseen of a water ingress filter.

In order to compensate for temperature influences, a high resolution temperature probe is integrated within the housing.

The housing is made of stainless steel and is terminated with an optical connector using a plastic tubing. Tubing lengths and connector can be specified following the needs of every application. The sensor also can be connectorised at both ends to make series configurations possible.

Features

The fibre optic humidity sensor HS-01 is an on/off sensor that detects water ingress or relative humidity above 80%. The sensor also can measure temperature with a resolution of 0,1°C and an accuracy of 1,0 °C respectively.

Applications

The humidity sensor HS-01 can be mounted on as well as embedded in all kind of structures for leakage detection of pipelines, dams, dikes,...

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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
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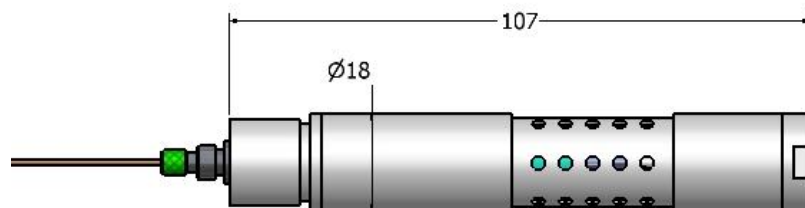
Humidity sensor HS-01

Standard specifications

Parameter	Unit	Value
Humidity range	% R. H.	ON/OFF
Threshold value	% R.H.	80
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 - 85
Tube diameter	mm	4 or 6
Tube length	cm	25 - 250
Connector type	-	FC/PC, FC/APC
Wavelength range	nm	1530-1570
Housing material		Stainless steel

¹ Extended temperature range possible on request

Technical drawing (in mm)



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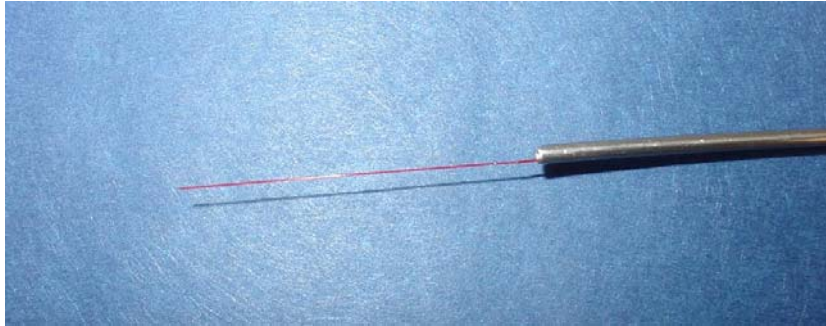
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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

SBS Strain Cable



Description

The SBS (Stimulated Brillouin Scattering) Strain Cable makes use of the inherent strain sensitivity of the Fibre. One single fibre can replace thousands of point sensors thanks to the distributed sensing concept. This concept refers to the use of a single optical fibre as a linear uninterrupted sensor providing multiple sensing points distributed over the whole fibre length.

The fibre is inserted into a stainless steel capillary with a diameter of 1,5 mm. The fibre is prestrained inside the capillary, which makes it possible to measure both extension and compression.

Features

The SBS Strain Cable can measure distributed strain with a resolution of $2 \mu\epsilon$ and an accuracy of $20 \mu\epsilon$. The sensor is also sensitive to temperature changes, 1°C corresponds to $20\mu\epsilon$. In order to compensate for these influences, the strain cable should be applied in combination with the SBS temperature cable.

Applications

Strain measurement of large structures such as pipelines, off-shore platforms, oil wells, dams, dykes, bridges, buildings, geostructures, tunnels, cables,...

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

SBS Strain Cable

Standard specifications

Parameter	Unit	Value	
Strain resolution	$\mu\epsilon$	2	
Strain accuracy	$\mu\epsilon$	20	
Min Spatial Resolution	m	0,5	
Process/ material			
		Thick-ness	Outer diam.
Optical fibres, SM (9/125 μm) , max 4 off	mm	-	0.25
Steel tube (AISI 304) with filling material and optical fibres	mm	0.15	1.5
Polymer Sheath (Optional)	mm	0.20-1.5	1.9-4.5
Physical Characteristics			
Outer diameter	mm	1.5	
Weight in air (approximately)	kg/km	6	
Minimum bending diameter, 1 cycle	mm	60	
Minimum repeated bending diameter	mm	100	
Operating temperature range, typical	$^{\circ}\text{C}$	-40 to +200 (According to fibre)	
Safe working load	N	200	
Breaking load	N	>650	
Axial Stiffness (E=196GPa, A=0.636mm ²)	kN	125	
Yield Strength	MPa	900	
Fibre slack within steel tube	%	0 or negative	
Optical characteristics			
Optical attenuation @ 1550 nm (max)	dB/km	Depends on Fibre	
Chromatic dispersion @ 1550 nm (max)	ps/nm-km		
Remarks			
<ul style="list-style-type: none"> The polymer material for the sheath will be selected according to environmental conditions. 			

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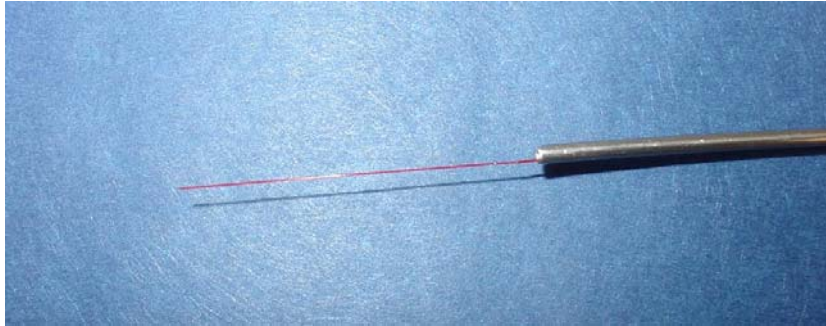
Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of the 'Fibre Optics Brillouin Analyzer DiTeST, STA200' measurement unit.

Released: April, 2006

SBS Temperature Cable



Description

The SBS (Stimulated Brillouin Scattering) Temperature Cable makes use of the inherent temperature sensitivity of the Fibre. One single fibre can replace thousands of point sensors thanks to the distributed sensing concept. This concept refers to the use of a single optical fibre as a linear uninterrupted sensor providing multiple sensing points distributed over the whole fibre length.

The fibre is inserted into a stainless steel capillary with a diameter of 3 mm. The capillary is filled with a special gel which keeps the fibre in a loose tube configuration. This loose tube configuration maintains the fibre stress free over the complete operating conditions.

Features

The SBS Temperature sensor can measure distributed temperatures with a resolution of 0.1 °C and an accuracy of 2°C. The maximum temperature range is 200°C.

Applications

Pipeline Monitoring, process control,...

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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

SBS Temperature Cable

Standard specifications

Parameter	Unit	Value	
Temperature resolution	°C	0,1	
Temperature accuracy	°C	2	
Min Spatial resolution	m	0,5	
Process/ material			
		Thick-ness	Outer diam.
Optical fibres, SM (9/125µm) , max 4 off	mm	-	0.25
Steel tube (AISI 304) with filling material and optical fibres	mm	0.20	3.0
Polymer Sheath (Optional)	mm	0.20 - 2.5	3.4 – 8.0
Physical Characteristics			
Outer diameter	mm	3.0	
Weight in air (approximately)	kg/km	18	
Minimum bending diameter, 1 cycle	mm	120	
Minimum repeated bending diameter	mm	200	
Operating temperature range, typical	°C	-40 to +200 (According to fibre)	
Safe working load	N	500	
Breaking load	N	>1750	
Axial Stiffness (E=196GPa, A=0.636mm ²)	kN	345	
Yield Strength	MPa	900	
Fibre slack within steel tube	%	0.25 – 0.35	
Optical characteristics			
Optical attenuation @ 1550 nm (max)	dB/km	Depends on Fibre	
Chromatic dispersion @ 1550 nm (max)	ps/nm·km		
Remarks			
<ul style="list-style-type: none"> • Maximum fibre excess length in tube is dependant on number of fibres. • The excess length is determined on basis of temperature region and tube configuration in application. • The polymer material for the sheath will be selected according to environmental conditions. 			

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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
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www.fos-s.be

Note: The reported resolution and accuracy values assume the use of the 'Fibre Optics Brillouin Analyzer DiTeST, STA200' measurement unit.

Released: April, 2006

Optical Fiber Multiple Incliner



Description

The Optical Fibre Multiple Incliner is based on the Fibre Bragg Grating technology. The individual inclinometers are connected together and slide into a special casing. The system is designed to be put inside a borehole and will allow measuring movement in the lateral direction of the borehole.

Features

The Optical Fibre Multiple Incliner can measure lateral movement of a borehole with a resolution of 10" and an accuracy of 0,5% Full Scale. The range will be +/- 1,5°.

Applications

The Incliner is used to measure lateral movement of earthworks or structures. It provides information on the magnitude of inclination or tilt of foundations and its variation with time. The system can be applied for measuring the location of depth, lateral displacement, deformation of soil, rock and retaining structures,...

Standard specifications

Parameter	Unit	Value
Range		± 1,5°
Resolution		10"
Minimum borehole	mm	Φ86
Maximum connective number	units	50
Accuracy	FS	0,5%
Wavelength range	nm	1530~1565
Type of cable		Single mode

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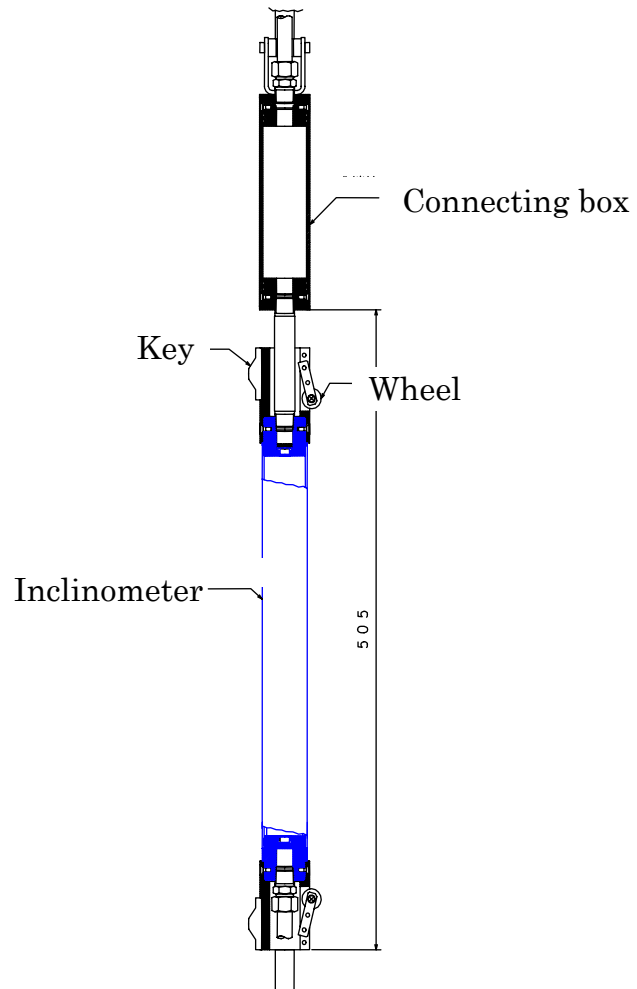
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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Optical Fiber Multiple Inclinator

Technical drawing



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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Released: April, 2006

Stress Monitoring System SMS-01

Earthquake monitoring



Description

The Fos&s stress monitoring system SMS-01 consists of several load cells (oil pads) which are positioned in different angles pertaining to each other.

Features

The stress monitoring system can measure load levels and temperature with a resolution of 0,05% Full Scale and 0,04 °C respectively and an accuracy of 1% Full Scale and 0,4 °C respectively. The load level can be chosen between 1 and 150 bar.

Applications

The stress monitoring system consists of different Load Cells which can be permanently installed in bore holes to measure absolute stresses and stress changes in ground or rock and this in different directions.

Standard specifications

Parameter	Unit	Value
Number of load cells		Maximum 4
Load range	bar	1 - 150
Load Resolution	bar	0,05% FS
Load accuracy	bar	1% FS
Temperature resolution	°C	0,1
Temperature accuracy	°C	1
Temperature range ¹	°C	0 to 85
FBG central wavelength	nm	1530 to 1570 nm
Connector type	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

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Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
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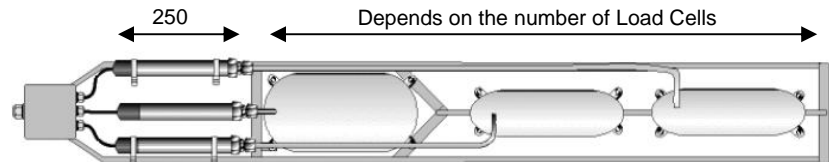
Released: April, 2006

Stress Monitoring System SMS-01

Technical Drawing (in mm)

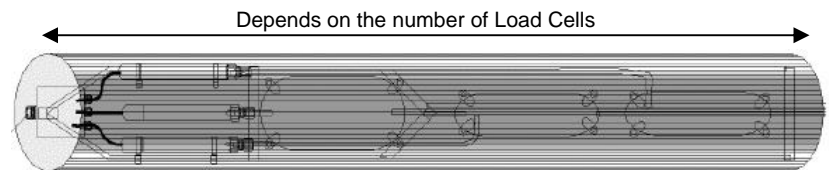
Soft Inclusion

Installation of the stress monitoring system into soft rock such as shale or clay.



Hard Inclusion

Installation of the stress monitoring system in hard rock the preferred method would be to prepare a hard inclusion.



Note: Other designs and setups are available upon request

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B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
info@fos-s.be
www.fos-s.be

Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 pm and a relative wavelength accuracy better than 10 pm.

Released: April, 2006

Borehole Deformation System BDS-01

Description

The borehole deformation system is based on the Fibre Bragg Grating technology and is designed to be put inside a borehole and will allow measuring the temperature and deformation in the longitudinal direction of this borehole. Figure 1 shows the principle of the deformation measurement system. The system consists of a number of extensometers outside the borehole which are placed in a canister. Within the borehole, different fixation points have been realized at well defined positions by using packers. From each fixation point, a carbon extension cable goes to the canister. The carbon extension cable is stretched using a spring mechanism. The extensometers in the canisters are connected to the outer ends of the carbon cable. In this way, any movement of the packers will be transduced to the extensometer. As a consequence, the displacement of the connected packer relative to the entrance of the borehole is measured. Furthermore, a temperature cable can be inserted to measure the temperature distribution inside the borehole.

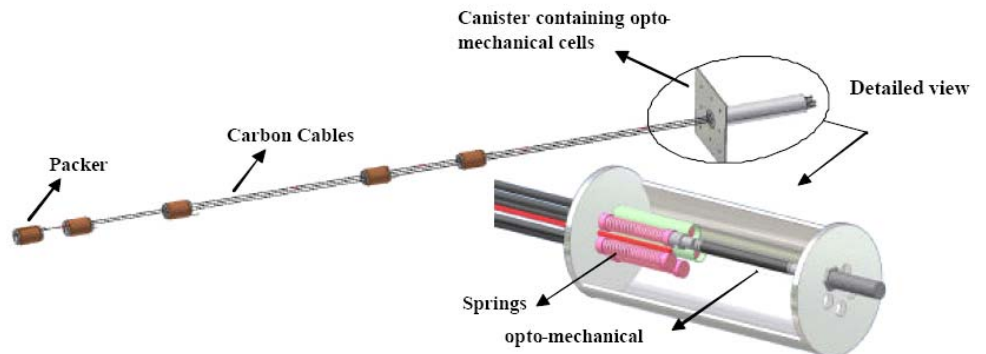


Figure 1: Schematic drawing of displacement measurement system

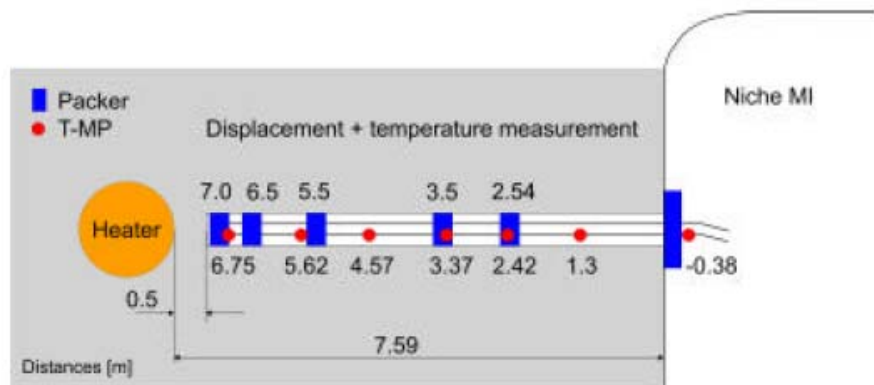


Figure 2: Example of the configuration of a Borehole Deformation

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B-2440 Geel
Belgium

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F +32 14 59 15 14
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Borehole Deformation System BDS-01

Features

The system can measure borehole deformations with a resolution of 0,2 μm and an accuracy of 2 μm . The borehole deformation system is also sensitive to temperature changes inside the borehole with a resolution of 0,04 $^{\circ}\text{C}$ and an accuracy 0,4 $^{\circ}\text{C}$.

Applications

The borehole deformation system can be applied for borehole deformation movements and thermo-mechanical characterization of clay, rock, granite and salt mines.

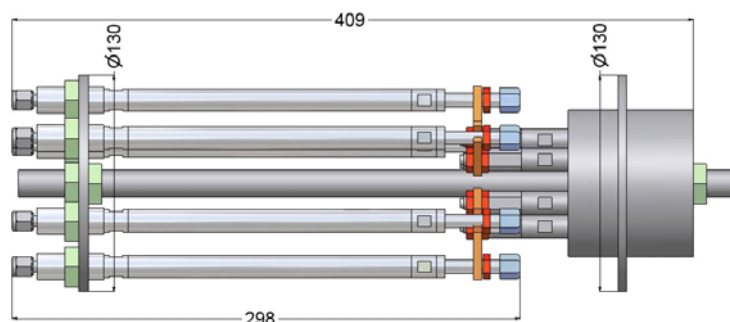
Standard specifications

Parameter	Unit	Value
Number of extensometers		Maximum 6
Displacement range w/o reset	mm	6
Displacement range	mm	On request
Displacement resolution	μm	0,20
Displacement accuracy	μm	2,0
Temperature resolution	$^{\circ}\text{C}$	0,04
Temperature accuracy	$^{\circ}\text{C}$	0,4
Temperature range ¹	$^{\circ}\text{C}$	0 to 85
Number of temperature sensing		On request
Depth of the borehole ²	m	Up to 50
Diameter of the borehole	mm	Max 90
FBG central wavelength	nm	1530 to 1570 nm
Connector type	-	FC/PC, FC/APC

¹ Extended temperature range possible on request

² Extended depths (borehole) possible on request

Technical drawing (in mm)



Note: The reported resolution and accuracy values assume the use of a measurement unit with a resolution better than 1 μm and a relative wavelength accuracy better than 10 μm .

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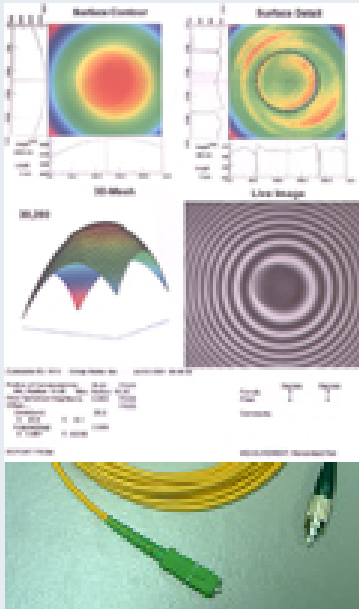
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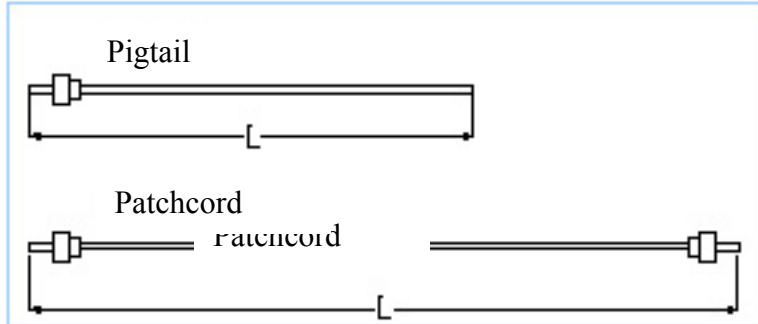
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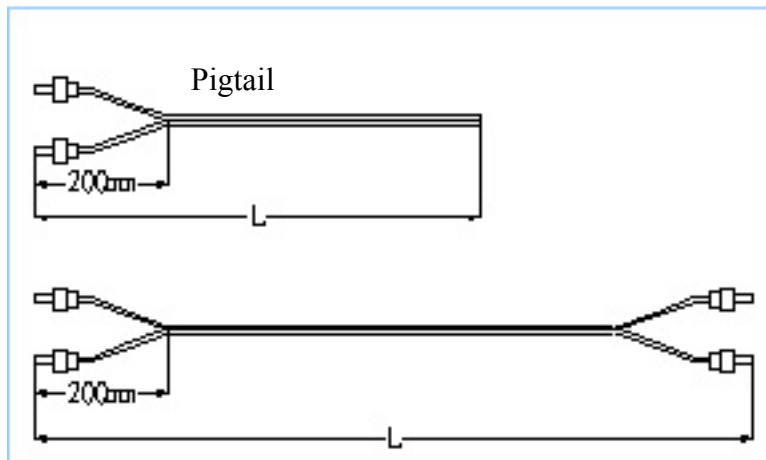
Pigtail and Patchcords



Simplex Cord



Duplex Cord



Ordering Information

Patchcord SC / PC - FC / PC / SM / Φ 2 / L M / Duplex
(or Pigtail) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Connector Type 1#	FC, SC, ST, MU, LC
② End-face Finishing	PC, UPC, APC
③ Fiber Count	4, 8 & 12 Fibers
④ Connector Type 2#	FC, SC, ST, MU, LC
⑤ End-face Finishing	PC, UPC, APC
⑥ Fiber Mode	SM: 9/125um MM : 62.5/125um or 50/125um
⑦ Cord Diameter	Φ 0.9, Φ 2, Φ 3
⑧ Cable Length	L=1,2,3,4... M=Meter i.e. 5M=5 Meter

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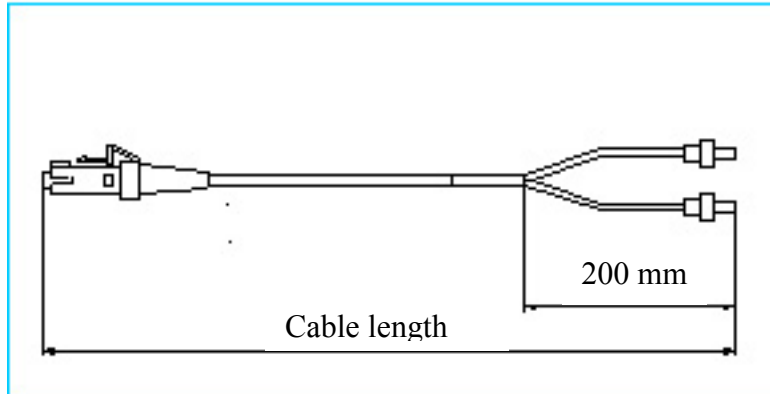
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Pigtail and Patchcords

MTRJ Cord



Ordering Information

MTRJ/PC - 2SC / PC / SM / Φ2 / L M
① ② ③ ④ ⑤ ⑥

① Connector Type 1#	MTRJ / PC
② Connector Type 2#	MTRJ, FC, SC, ST, MU, LC
③ Endface Finishing	PC, UPC, APC
④ Fiber Mode	SM=single mode, MM =multimode
⑤ Cord Diameter	Φ2, Φ3
⑥ Cable Length L	Unit: Meter i.e. 3=3 Meter

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Fiber Optic Sensors
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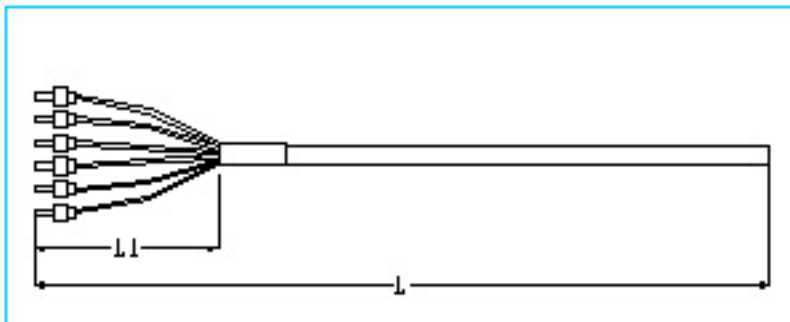
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Belgium

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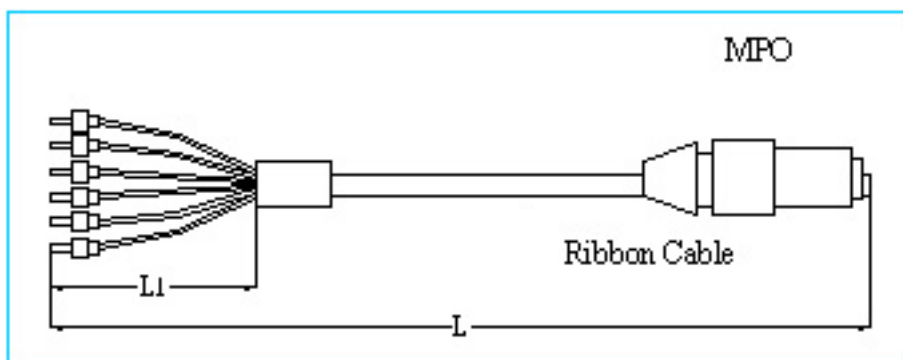
Released: April, 2006

Multifiber Assemblies

Bundle Cord



Ribbon Cord



Ordering Information

Fan-out R 12F-SC /UPC / SM /Φ09- L / L1 M

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Cable	B: Bundle Cable R: Ribbon Cable
② Fiber Count	4, 6, 8, 12 & 24 Fibers
③ Connector	FC, SC, ST, MU, LC
④ Endface Finishing	PC, UPC, APC
⑤ Fiber Mode	SM=single mode, MM =multimode
⑥ Cord Diameter	Φ2, Φ0.9
⑦ Cable Length L	Unit: Meter i.e. 3=3 Meter
⑧ Pigtail Length L1	Unit: Meter i.e. 05= 0.5Meter

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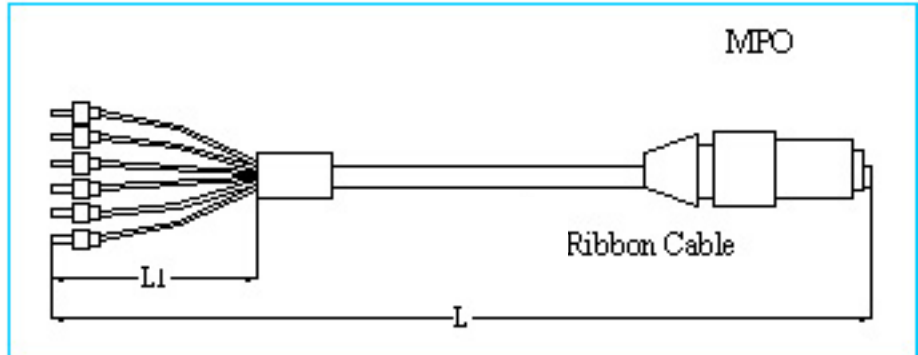
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Multifiber Assemblies

MPO Patchcord



Ordering Information

MPO Fan-out :

MPO / PC / 12F - FC / PC / SM / Φ 2 - L / L1

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Connector Type 1#	MPO (female or male)
② End-face Finishing	APC、 PC
③ Fiber Count	4, 8 & 12 Fibers
④ Connector Type 2#	MPO, FC, SC, ST, MU, LC
⑤ End-face Finishing	PC, UPC , APC
⑥ Fiber Mode	SM: 9/125um MM : 62.5/125um or 50/125um
⑦ Cord Diameter	Φ 2、 Φ 0.9
⑧ Cable Length	L=1,2,3,4... M=Meter i.e. 5M=5 Meter
⑨ Pigtail Length	L1=01,02,03,04... M=Meter i.e. 05M=0.5Meter

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Outdoor Cable

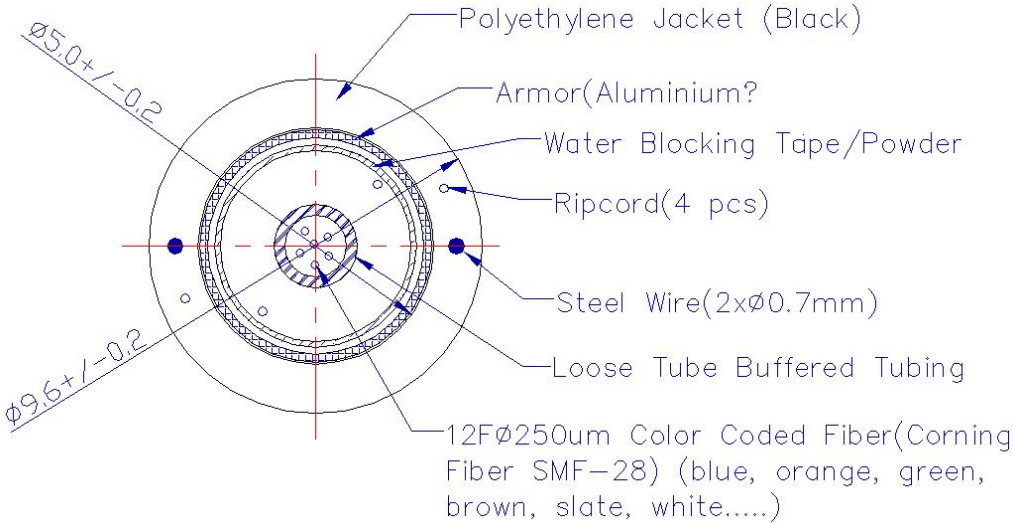
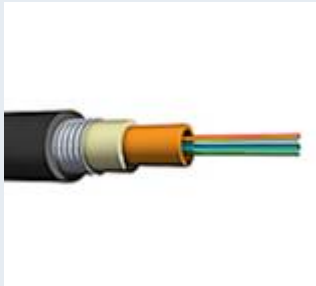
Outdoor Cable

Our Outdoor Cable is a central tube, loose tube product used in various outside plant applications. Its compact design holds up to 12 fibers.

Temperature Range

Operating -40 °C to +70 °C
 Storage -40 °C to +75 °C
 Installation 0 °C to +70 °C

Technical Drawing



Ordering Information

Outdoor Cable OC 12F-SC /UPC / SM / ϕ 09- L / L1 M

- ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Cable	OC : Outdoor Cable
② Fiber Count	12 Fibers
③ Connector	FC, SC, ST, MU, LC
④ Endface Finishing	PC, UPC, APC
⑤ Fiber Mode	SM=single mode, MM =multimode
⑥ Cord Diameter	ϕ 2, ϕ 0.9
⑦ Cable Length L	Unit: Meter i.e. 3=3 Meter
⑧ Pigtail Length L1	Unit: Meter i.e. 05= 0.5Meter



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Cipalstraat 14
B-2440 Geel
Belgium

T +32 14 58 11 91
F +32 14 59 15 14
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Product Description

Geodetect

501 116 | 09.2003

polyfelt[®]
Geosynthetics

Geodetect - the world's first "intelligent" geosynthetic!

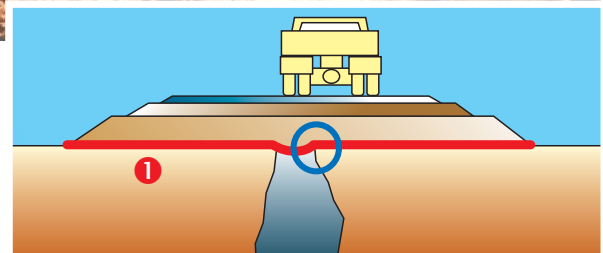
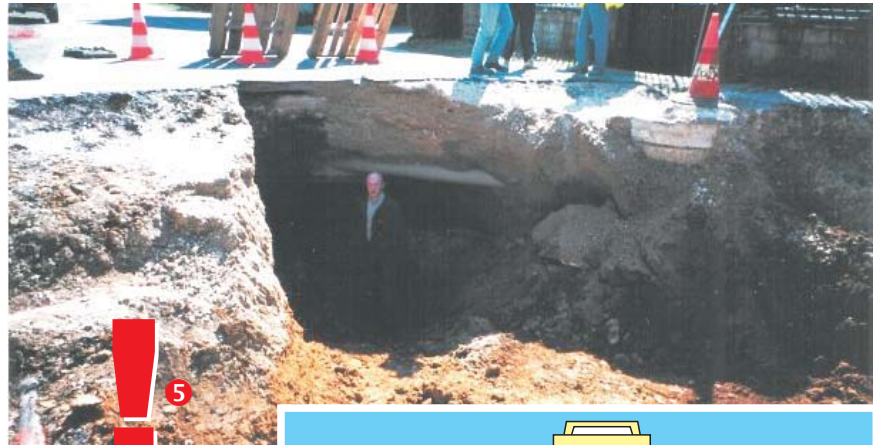
Geodetect is an innovative geotextile-based monitoring system. It consists of polyfelt.Rock PEC high strength geotextiles, equipped with optical fibres linked to a monitoring device and iPAQ, PC or laptop. The system is designed to increase the safety of civil-engineering infrastructure through cost-effective predictive maintenance, especially in sensitive areas.

The System

Geodetect is a system developed for the measurement of strain, allowing **monitoring of earthworks structures reinforced with geosynthetics**.

Possible application areas are roads & railways, retaining walls, tunnels and other underground structures, pipes (for gas, water, oil,...) etc.

Geodetect offers an economic solution to ensure the safety of earth-work structures, and to prevent them from damage and consequent risks. It is especially applicable to geotechnically **sensitive areas** such as carstic zones, mining areas, areas with highly compressive soils, etc.



The Benefits

- Combines reinforcement, strain measurement and warning system
- High reliability (insensitive to the environment)
- Very high sensitivity (measuring deformations of < 0,01%)
- High durability in soils
- Interrogation system adjusted to the needs of the user
- Survey and monitoring of very large areas possible
- Applicable to a wide range of geosynthetics for soil reinforcement

The principle of Geodetect:

polyfelt.Rock PEC **1** is equipped with optical fibres which are connected to a data collection device (Spectraleye Interrogator **2**). Elongation is continuously measured, and data are transferred to the iPAQ as part of the Spectraleye or to a PC or laptop **3**. When elongation reaches a defined level **4**, a warning will be handed out **5**, allowing for preventive measures!

The Spectraleye Interrogator is a hand-held interrogator capable of connection to a PDA for punctual checking on instrumented earthworks. This is an interesting solution for the long-term monitoring of structures, when the risk cannot justify a continuous survey.