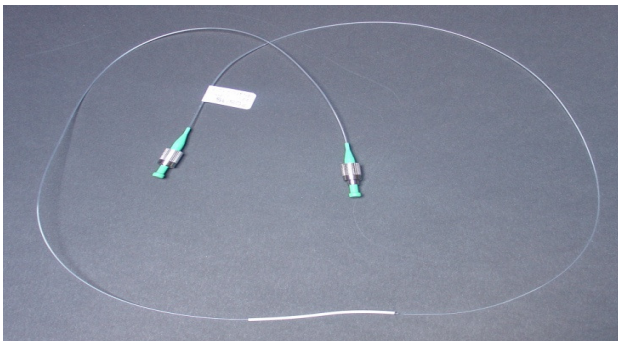
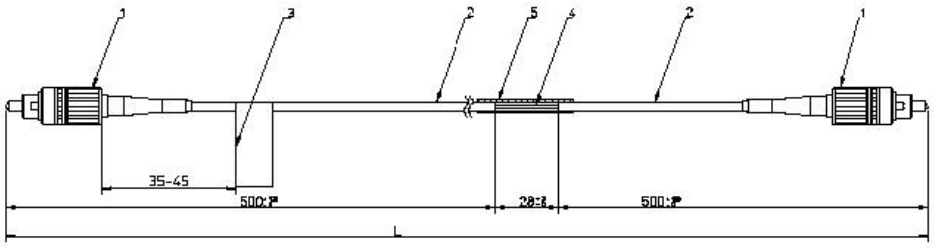
Strain Gage SG-01

Description

The Strain Gage SG-01 is the fibre optic equivalent of an electrical strain gage. It consists of a fibre containing a FBG that can be mounted directly on the surface of a structure by means of an adhesive. In this way, the fibre sensor makes direct contact with the surface and therefore measures directly the strain at the surface. Installation of the optical strain gage happens preferably by means of the FOS&S Strain Gage Installation Kit (SGK-01) .



The FBG is a Draw Tower Grating (DTG): the grating is written in the fibre while drawing it and before the fibre coating is being applied. This gives the sensor high strength (> 5 % strain at breakage) and therefore ensures an excellent fatigue behaviour at moderate strain levels. The coating is an Organic Modified Ceramic (ORMOCER®), which has ideal bonding with the fibre glass and which is excellent for transferring strain because of its relatively high Young's Modulus. These properties make that the coating does not need to be removed prior to installation of the sensor. Like for electrical foil gages, the optical strain gage is also sensitive to temperature variations. However, these can be eliminated by means of standard compensating methods.



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In its standard configuration, the sensor has a protective tubing before (2) and after (2) the sensor area (4) and it has a free fibre length of 28 mm centred around the FBG (4). A rubber sleeve (5) is placed over the free fibre part for protective purposes and needs to be removed before installation. The sensor has a connector at both ends (1). The fibre is fixed to the tubing so that it can be kept straight by slightly pulling at the tubing.

Features

Buffered fibre sensor with a free fibre length around the FBG for direct fixation of the sensor to various surfaces.
High strength FBG, implying high strain levels and excellent fatigue resistance.
Fibre coating does not have to be removed before fixation because of its relatively high Young's modulus and excellent bonding properties to the fibre glass.
The gage factor is determined at batch level with high accuracy.

Applications

The fibre optic Strain Gage SG-01 can be applied to measure strain changes (due to tension, compression and bending) of metallic or composite structures. In this way, it allows to deduce the stresses which act upon the structure that is being monitored. In combination with high speed interrogators, also vibrational analysis can be performed.

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Standard specifications

Parameter	Value
Gage factor (k)	0.777 (typical)
Relative statistical error on gage factor	0.5 %
Transverse sensitivity[1,2]	< 2.1 10^{-3}
Temperature coefficient of gage factor[3]	2.7 10^{-4} 1/°C
Strain range[4]	1 %(long term) 5 %(short term)
Strain gage wavelength	1510 nm-1590 nm (selectable)
Temperature sensitivity strain gage wavelength[5]	0.010 nm/°C(typical)
Active gage length (FBG length)	8 mm
Overall gage length (free fiber length)	28 mm
Coating material	ORMOCER ®
Fibre Diameter (coated)	195 µm
Operating temperature range[4]	-50 to +130
Tubing material	FEP °C
Tubing diameter	900 µm
Tubing length (left and right from strain gage)	45 cm
Connector type	FC/APC

[1] According to ASTM E 251-92. The transverse strain sensitivity is the ratio of the gage factor of a strain gage mounted perpendicular to a uniaxial strain field (transverse gage) to the gage factor of a similar gage mounted parallel to the same strain field (longitudinal gage).
[2] Assuming installation procedure according to FOS&S' prescribed procedure.
[3] The temperature coefficient of the gage factor k expresses the relative variation of k per degree Celsius.
[4] Of the free fibre. The specified range for the fixed FBG depends also on the used adhesive and on the bonding conditions of the FBG to the surface. Temperature range is only specified for the sensor, not for the connector. Splicing is recommended for the extreme temperature values.
[5] The intrinsic temperature sensitivity of the FBG; does not include the thermal expansion of the structure to which the sensor is attached.

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Ordering information

A standard package includes 5 SG-01 sensors. The wavelengths of all these gages are identical and can be chosen according to the table below. A mix of selectable wavelengths can be obtained as well for the strain gauge kit (SGK-01). The wavelengths should be specified as indicated below.

Example:

S	G	0	1	-	x	x

Nominal wavelength	
Standard	
S1	1510 nm
S2	1515 nm
S3	1520 nm
S4	1525 nm
S5	1530 nm
S6	1535 nm
S7	1540 nm
S8	1545 nm
S9	1550 nm
S10	1555 nm
S11	1560 nm
S12	1565 nm
S13	1570 nm
S14	1575 nm
S15	1580 nm
S16	1585 nm
Strain Gauge Kit refills	
1A	1527 nm
2A	1534 nm
3A	1541 nm
4A	1548 nm
5A	1555 nm
1B	1530,5 nm
2B	1537,5 nm
3B	1544,5 nm
4B	1551,5 nm
5B	1558,5 nm
MA	Mix: 1A, 2A, …5A
MB	Mix: 1B, 2B, …5B
Custom Contact sales department	

This product has been developed in the framework of a joint collaboration between the Belgian Science Policy and the Federal Public Service of Economy, SMEs, Independent Professions and Energy of Belgium.

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