



Description

The featured FemtoSecond Grating (FSG®) is a fiber Bragg grating fabricated with ultra-short laser pulses, using a special through-the-coating inscription technique. The inscribed FSG® maintains the pristine high strength of the optical fiber and adds new performance features. The FSG-Axx is a uniform apodized grating written into a high-strength optical fiber, optimized for operation in the 1550nm wavelength window.

The FSG®s are fabricated in a special process using high-power laser pulses of a femtosecond laser, which are guided via special optics to go through the coating of a standard optical fiber and to form a specific modulation in the index of refraction of its core without damaging the coating. The inscribed modulation characteristic defines the desired Bragg wavelength. By repeating this inscription process, an array of progressive Bragg wavelengths can be inscribed. Similar to our DTG® inscription, this process leaves the optical fiber in its pristine mechanical strength.

The different FemtoSecond Grating Types are inscribed in different fiber types:

- FSG-A01: Polyimide coated, low attenuation fiber
- FSG-A02: Polyimide coated, reduced cladding fiber with low bend loss
- FSG-A03: Polyimide coated, bend insensitive, low attenuation fiber
- FSG-A04: Polyimide coated, pure silica core fiber
- FSG-A05: ORMOCER® coated, low bend loss
- FSG-A06: ORMOCER® coated, low attenuation fiber
- FSG-A07: ORMOCER® coated, reduced cladding fiber with low bend loss
- FSG-A08: Polyimide coated, bend insensitive fiber
- FSG-A09: ORMOCER®-T coated, low bend loss
- FSG-A10: ORMOCER®-T coated, low attenuation fiber
- FSG-A11: ORMOCER®-T coated, reduced cladding fiber with low bend loss
- FSG-A12: ORMOCER® coated, bend insensitive, low attenuation fiber
- FSG-A13: ORMOCER®-T coated, bend insensitive, low attenuation fiber

Features

- Extremely high mechanical strength FBG sensor compared to the ones inscribed via the conventional strip-and-recoat process and femtosecond point-by-point (PbP) inscription techniques.
- Spliceless FBG chains with a high number and density of sensor elements.
- Uniform coating along the whole length of the optical fiber, including FBG positions.
- Polyimide coating offers excellent adhesion and strain transfer properties.
- Polyimide coating offers excellent resistance to harsh environmental parameters, including high temperature operating ranges.
- Low attenuation or Low Bend loss depending on fiber type.



Specifications

Parameter	FSG-A01	FSG-A02	FSG-A03	FSG-A04	FSG-A05	FSG-A06	FSG-A07
Reflectivity ¹	≥ 50%	≥ 15%	≥ 50%	≥ 50%	≥ 50%	≥ 50%	≥ 50%
FWHM (Typical value) ¹	300 pm	200 pm	300 pm	300 pm	200 pm	300 pm	200 pm
Min Max variation within array	3dB						
Centre wavelength ¹	1470 nm to 1610 nm						
Absolute wavelength accuracy ¹	≤ 0.5 nm						
Grating length ¹	~ 4 mm						
Grating type	Uniform apodized						
Side Lobe Suppression ratio (Typical value)	> 10 dB	> 12 dB	> 10 dB	> 10 dB	> 12 dB	> 10 dB	> 12 dB
Grating separation (center to center) ¹	≥ 5 mm						
Fiber coating	Polyimide				ORMOCER®		
Core diameter	10.4 μm	5.3 μm	9.8 μm	9 μm	6 μm	7.8 μm	6 μm
Cladding diameter	125 μm	80 μm	125 μm	125 μm	125 μm	125 μm	80 μm
Coating diameter	155 μm	102 μm	155 μm	155 μm	195 μm	195 μm	120 μm
Numerical Aperture	0.11-0.14	0.23-0.25	0.13	0.11-0.14	0.26	0.14	0.26
Fiber attenuation	≤ 0.6 dB/km	≤ 1.5 dB/km	≤ 0.4 dB/km	≤ 0.8 dB/km	≤ 8.6 dB/km	≤ 1 dB/km	≤ 8.6 dB/km
Temperature Operating range	-55 to 300°C				-55 to 200°C		
Typical Tensile strength FSG according to IEC60793 @ 30 mm/min	> 4 GPa (~5% strain)						

Parameter	FSG-A08	FSG-A09	FSG-A10	FSG-A11	FSG-A12	FSG-A13
Reflectivity ¹	≥ 50%	≥ 50%	≥ 50%	≥ 50%	≥ 50%	≥ 50%
FWHM (Typical value) ¹	200 pm	200 pm	300 pm	200 pm	200 pm	200 pm
Min Max variation within array	3dB					
Centre wavelength ¹	1470 nm to 1610 nm					
Absolute wavelength accuracy ¹	≤ 0.5 nm					
Grating length ¹	~ 4 mm					
Grating type	Uniform apodized					
Side Lobe Suppression ratio (Typical value)	> 12 dB	> 12 dB	> 10 dB	> 12 dB	> 10 dB	> 10 dB
Grating separation (center to center) ¹	≥ 5 mm					
Fiber coating	Polyimide	ORMOCER-T			ORMOCER®	ORMOCER-T
Core diameter	6.4 μm	6 μm	7.8 μm	6 μm	9.8 μm	9.8 μm
Cladding diameter	125 μm	125 μm	125 μm	80 μm	125 μm	125 μm
Coating diameter	155 μm	195 μm	195 μm	120 μm	195 μm	155 μm
Numerical Aperture	0.19-0.21	0.26	0.14	0.26	0.13	0.13
Fiber attenuation	≤ 0.75 dB/km	≤ 8.6 dB/km	≤ 1 dB/km	≤ 8.6 dB/km	≤ 1 dB/km	≤ 1 dB/km
Temperature Operating range	-55 to 300°C	-55 to 200°C				
Typical Tensile strength FSG according to IEC60793 @ 30 mm/min	> 4 GPa (~5% strain)					

Remarks: ¹Other values are possible on request