



### Single-Mode Fiber

**Product Type:** G.652.D

**Issue date:** 06/09 (A)

**Coating Type:** ColorLock-XS and Natural

**Supersedes:** 11/07

For telecom applications

- Long-Haul
- Metropolitan
- Access
- FTTx
- Premises

Draka's Enhanced Single-Mode Fiber (ESMF) provides improved performance across the entire 1260 nm to 1625 nm wavelength spectrum. It has a low dispersion in the 1310 nm window and low attenuation in the 1383 nm water-peak region to allow use of the extended band (1360 nm to 1460 nm). With its wide operating spectrum, ESMF expands the future growth capability of the fiber and allows flexible configuration of voice, data, and video services within the fiber. It can be used in all cable constructions, including loose tube, tight buffered, ribbon, and central tube designs.

The tighter geometrical, attenuation and PMD specifications of ESMF enable superior performance in long-haul, metropolitan, access and premises applications in telecommunications, CATV and utility networks. ESMF is completely interchangeable with standard single-mode fiber.

Draka's Advanced Plasma Vapor Deposition (APVD™) manufacturing process ensures the highest quality and purity of fibers. Proprietary ColorLock™ coating process further enhances the performance, durability and reliability of the fiber, even in the harshest environments.

The fiber complies with or exceeds the ITU-T Recommendation G.652.D, the IEC International Standard 60793-2-50 type B.1.3 Optical Fiber Specification, Telcordia GR-20-CORE, ANSI/ICEA S-87-640 and RUS 7CFR 1755.900.



Value Innovation is a way of looking at the world. How we can help our customers do more, make more, save more, achieve more.

### Key Industry Leading Milestones

- 1998 ● ColorLock™: world only life time guaranteed colored fibers
- 2001 ● Enhanced SMF more than two years in advance on international standards
- 2008 ● ColorLock-XS: extreme protection against micro-bendings

Features	Benefits
Low 1383 nm (water-peak) attenuation	Provides expanded fiber capacity and cost savings through use of cheaper lasers in the entire 1260 to 1625 nm range, multiplexing filters and higher number of channels
Low hydrogen sensitivity	Low attenuation in the 1383 nm region even as fiber ages, for improved performance and long life
Lower PMD of 0.06 ps/√km link design value	Extends the PMD distance performance, reducing regeneration costs
Low 1460 nm attenuation (< 0.25 dB/km)	<ul style="list-style-type: none"> <li>• Easy design of low cost laser and filter based systems over a wide wavelength range</li> <li>• Ensure efficient Raman pumping for C-band amplification</li> </ul>
Proprietary PCVD and APVD™ manufacturing process	Superior geometry, uniformity and purity
Revolutionary ColorLock-XS coating process	Increased reliability, durability, and superior aging performance, resulting in lower maintenance and replacement costs. Makes color a component of the coating, thus enhancing fiber identification and colored fiber reliability. Consistent, vibrant color for easy-of-use and flexibility

**Optical Specifications (Uncabled fiber)**
**Attenuation**

	(dB/km)
Attenuation at 1310 nm	0.33 – 0.35
Attenuation at 1383 nm*	0.32 – 0.35
Attenuation at 1460 nm	0.25
Attenuation at 1550 nm	0.19 – 0.21
Attenuation at 1625 nm	0.20 – 0.23

\* Including H2-aging according to IEC 60793-2-50, type B.1.3  
Other values available on request.

**Attenuation vs. Wavelength**

Wavelength range (nm)	Reference $\lambda$ (nm)	(dB/km)
1285 - 1330	1310	$\leq 0.03$
1525 - 1575	1550	$\leq 0.02$
1460 - 1625	1550	$\leq 0.04$

**Point discontinuities**

No point discontinuity greater than 0.05 dB at 1310 nm and 1550 nm.

**Attenuation with Bending**

Number of Turns	Mandrel Radius (mm)	Wavelength (nm)	Attenuation (dB)
100	25	1310	$\leq 0.05$
100	25	1550	$\leq 0.05$
100	30	1625	$\leq 0.05$

**Cutoff Wavelength**

Cable Cutoff wavelength ( $\lambda_{ccf}$ )	$\leq 1260$ nm
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**Mode Field Diameter**

Wavelength (nm)	( $\mu$ m)
1310	8.8 to 9.6
1550	9.6 to 10.6

**Chromatic Dispersion**

Wavelength (nm)	(ps/(nm.km))
1285 – 1330	$\leq  3 $
1550	$\leq 18.0$
1625	$\leq 22.0$

Zero Dispersion Wavelength ( $\lambda_0$ ): 1300 - 1322 nm  
Slope ( $S_0$ ) at  $\lambda_0$ :  $\leq 0.090$  ps/(nm<sup>2</sup>.km)

**Polarization Mode Dispersion (PMD)**

	(ps/ $\sqrt$ km)
PMD Link Design Value**	$\leq 0.06$
Max. Individual Fiber	$\leq 0.1$

\*\* According to IEC 60794 -3, Ed 3 (Q=0.01%)

**Geometrical Specifications**
**Glass Geometry**

Cladding Diameter	125.0 $\pm$ 0.7 $\mu$ m
Core/Cladding Concentricity Error	$\leq 0.5$ $\mu$ m
Cladding Non-Circularity	$\leq 0.7$ %
Fiber Curl (radius)	$\geq 4$ m

**Coating Geometry**

Coating Diameter	242 $\pm$ 7 $\mu$ m
Coating/Cladding Concentricity Error	$\leq 12$ $\mu$ m
Coating Non-Circularity	$\leq 5$ %
Lengths	Standard lengths up to 50.4 km

**Mechanical Specifications**
**Proof test**

The entire length is subjected to a tensile proof stress > 0.7 GPa (100 kpsi); 1% strain equivalent.

**Tensile Strength**

Dynamic tensile strength (0.5 meter gauge length):  
Aged\*\*\* and unaged: median > 3.8 GPa (550 kpsi)  
\*\*\* Aging at 85°C, 85% RH, 30 days

**Dynamic and Static Fatigue**

Dynamic fatigue, unaged and aged\*\*\*  $n_d > 20$   
Static fatigue, aged\*\*\*  $n_s > 23$

**Coating Performance**

Coating strip force unaged and aged\*\*\*\*:  
- Average strip force: 1 N to 3 N  
- Peak strip force: 1.2 N to 8.9 N  
\*\*\*\* Aging:  
• 0°C and 45°C  
• 30 days at 85°C and 85% RH  
• 14 days water immersion at 23°C  
• Wasp spray exposure (Telcordia)

**Environmental Specifications**

Environmental Test	Test Conditions	Induced Attenuation at 1310, 1550 nm (dB/km)
Temperature cycling	-60°C to 85°C	$\leq 0.05$
Temperature-	-10°C to 85°C, 4-98% RH	$\leq 0.05$
Humidity cycling		
Water Immersion	14 days; 23°C	$\leq 0.05$
Dry Heat	30 days; 85°C	$\leq 0.05$
Damp Heat	30 days; 85°C; 85% RH	$\leq 0.05$

**Typical Specifications**

Nominal Zero Dispersion Slope	0.085 ps/(nm <sup>2</sup> .km)
Effective group index @ 1310 nm	1.467
Effective group index @ 1550 nm	1.468
Effective group index @ 1625 nm	1.468
Rayleigh Backscatter Coefficient for 1 ns pulse width:	
@ 1310 nm	-79.4 dB
@ 1550 nm	-81.7 dB
@ 1625 nm	-82.5 dB

Median Dynamic Tensile Strength 5.3 GPa (750 kpsi)  
(Aged at 85°C, 85% RH, 30 days; 0.5 m gauge length)