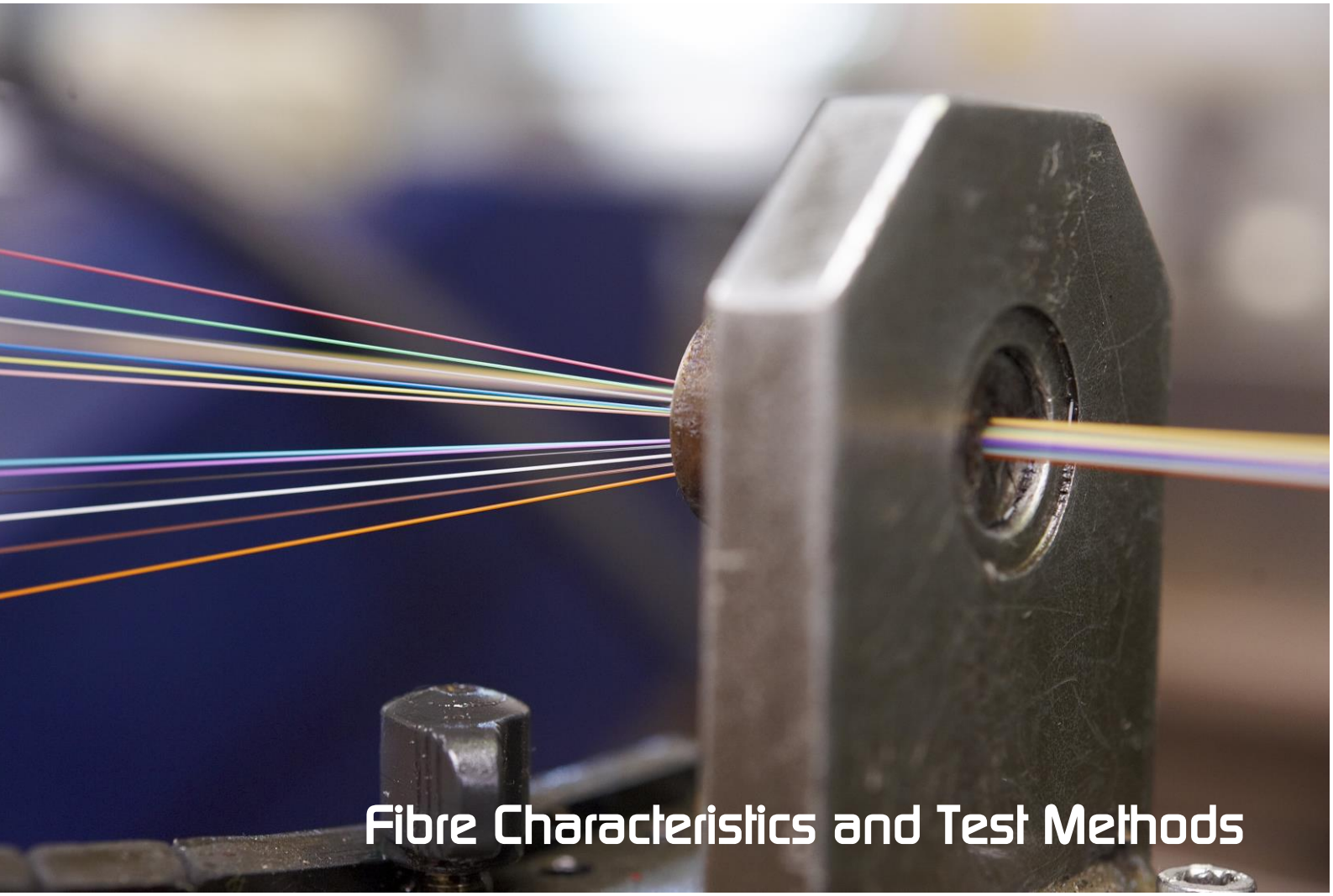
B3 International



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Single-Mode Fibres

G.652.D Single-Mode Optical Fibre Specifications

Corning® SMF-28e+® Fibre	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm
Attenuation – Loose Tube Cables	
@ 1310 nm (typical / maximum)	0,31 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,20 / 0,24 dB/km
@ 1625 nm (typical / maximum)	0,21 / 0,26 dB/km
Attenuation – Tight Buffer Cables	
@ 1310 nm (typical / maximum)	0,30 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,35 / 0,40 dB/km
Dispersion	
@ 1550 nm	≤ 18 ps/nm.km
@ 1625 nm	≤ 22 ps/nm.km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1304 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Group Refractive Index	
@ 1310 nm	1,4676
@ 1550 nm	1,4682
Mode Field Diameter	
@ 1310 nm	9,2 ± 0,4 µm
@ 1550 nm	10,4 ± 0,5 µm
Cut-Off Wavelength (λ_{cc})	≤ 1260 nm
PMD Individual Fiber	< 0,1 ps/√km
Tensile Proof Test	≥100 kpsi (0,7 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Wet, 14-day room temperature	3N
Macrobending 100 turns, 60 mm, @ 1625 nm	< 0,03 dB
Macrobending 100 turns, 50 mm, @ 1310 nm	< 0,03 dB
Macrobending 100 turns, 50 mm, @ 1550 nm	< 0,03 dB
Macrobending 1 turn, 32 mm, @ 1550 nm	< 0,03 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.652.D Low Loss Single-Mode Optical Fibre Specifications

Corning® SMF-28e+® LL Optical Fiber	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter (Uncoloured)	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm
Attenuation – Loose Tube Cables	
@ 1310 nm (typical / maximum)	0,31 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,20 / 0,24 dB/km
@ 1625 nm (typical / maximum)	0,21 / 0,26 dB/km
Attenuation – Tight Buffer Cables	
@ 1310 nm (typical / maximum)	0,30 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,35 / 0,40 dB/km
Dispersion	
@ 1550 nm	≤ 18 ps/nm.km
@ 1625 nm	≤ 22 ps/nm.km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1304 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Group Refractive Index	
@ 1310 nm	1,4676
@ 1550 nm	1,4682
Mode Field Diameter	
@ 1310 nm	9,2±0,4 µm
@ 1550 nm	10,4±0,5 µm
Cut-Off Wavelength (λ_{cc})	≤ 1260 nm
PMD Individual Fiber	< 0,1 ps/√km
Tensile Proof Test	100 kpsi (0,69 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Wet, 14-day room temperature	3N
Macrobending 100 turns, 60 mm, @ 1625 nm	≤ 0,03 dB
Macrobending 100 turns, 50 mm, @ 1550 nm	≤ 0,03 dB
Macrobending 100 turns, 50 mm, @ 1310 nm	≤ 0,03 dB
Macrobending 1 turn, 32 mm, @ 1550 nm	≤ 0,03 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.657.A1 Bend Insensitive Single-Mode Optical Fibre Specifications

Corning® SMF-28® Ultra Optical Fibre	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter (Uncoloured)	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm
Attenuation – Loose Tube Cables	
@ 1310 nm (typical / maximum)	0,31 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,20 / 0,24 dB/km
@ 1625 nm (typical / maximum)	0,21 / 0,26 dB/km
Attenuation – Tight Buffer Cables	
@ 1310 nm (typical / maximum)	0,30 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,35 / 0,40 dB/km
Dispersion	
@ 1550 nm	≤ 18 ps/nm.km
@ 1625 nm	≤ 22 ps/nm.km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1304 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Group Refractive Index	
@ 1310 nm	1,4676
@ 1550 nm	1,4682
Mode Field Diameter	
@ 1310 nm	9,2±0,4 µm
@ 1550 nm	10,4±0,5 µm
Cut-Off Wavelength (λ_{CC})	≤ 1260 nm
PMD Individual Fiber	< 0,1 ps/√km
Tensile Proof Test	100 kpsi (0,69 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Wet, 14-day room temperature	3N
Macrobending 100 turns, 25 mm, @ 1310 nm	≤ 0,01 dB
Macrobending 100 turns, 25 mm, @ 1625 nm	≤ 0,01 dB
Macrobending 100 turns, 25 mm, @ 1625 nm	≤ 0,01 dB
Macrobending 10 turns, 15 mm, @ 1550 nm	≤ 0,05 dB
Macrobending 10 turns, 15 mm, @ 1625 nm	≤ 0,30 dB
Macrobending 1 turn, 10 mm, @ 1550 nm	≤ 0,5 dB
Macrobending 1 turn, 10 mm, @ 1625 nm	≤ 1,5 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.657.A1 Bend Insensitive 200um Single-Mode Optical Fibre Specifications

Corning® ClearCurve® Ultra Optical Fiber	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter	200 ± 10 µm
Attenuation – Loose Tube Cables	
@ 1310 nm (typical / maximum)	0,31 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,20 / 0,24 dB/km
@ 1625 nm (typical / maximum)	0,21 / 0,26 dB/km
Attenuation – Tight Buffer Cables	
@ 1310 nm (typical / maximum)	0,30 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,35 / 0,40 dB/km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1304 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Mode Field Diameter	
@ 1310 nm	8,6±0,4 µm
Cut-Off Wavelength (λ_{cc})	≤ 1260 nm
Tensile Proof Test	100 kpsi (0,69 GPa)
Macrobending 10 turns, 30 mm, @ 1550 nm	≤ 0,05 dB
Macrobending 1 turn, 20 mm, @ 1550 nm	≤ 0,5 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.657.A2 Bend Insensitive Single-Mode Optical Fibre Specifications

Corning® ClearCurve® LBL Optical Fibre	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter (Uncoloured)	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm
Attenuation – Loose Tube Cables	
@ 1310 nm (typical / maximum)	0,31 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,20 / 0,24 dB/km
@ 1625 nm (typical / maximum)	0,21 / 0,26 dB/km
Attenuation – Tight Buffer Cables	
@ 1310 nm (typical / maximum)	0,30 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,35 / 0,40 dB/km
Dispersion	
@ 1550 nm	≤ 18 ps/nm.km
@ 1625 nm	≤ 23 ps/nm.km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1304 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Group Refractive Index	
@ 1310 nm	1,467
@ 1550 nm	1,4677
Mode Field Diameter	
@ 1310 nm	8,6±0,4 µm
@ 1550 nm	9,6±0,5 µm
Cut-Off Wavelength (λ_{cc})	≤ 1260 nm
PMD Individual Fiber	< 0,2 ps/√km
Tensile Proof Test	100 kpsi (0,69 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Macrobending 1 turn, 7,5 mm, @ 1550 nm	≤ 0,4 dB
Macrobending 1 turn, 7,5 mm, @ 1625 nm	≤ 0,8 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.657.B3 Bend Insensitive Single-Mode Optical Fibre Specifications

Corning® ClearCurve® ZBL Optical Fibre	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter (Uncoloured)	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm
Attenuation – Loose Tube Cables	
@ 1310 nm (typical / maximum)	0,31 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,20 / 0,24 dB/km
@ 1625 nm (typical / maximum)	0,21 / 0,26 dB/km
Attenuation – Tight Buffer Cables	
@ 1310 nm (typical / maximum)	0,30 / 0,35 dB/km
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,35 / 0,40 dB/km
Dispersion	
@ 1550 nm	≤ 18 ps/nm.km
@ 1625 nm	≤ 23 ps/nm.km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1304 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Group Refractive Index	
@ 1310 nm	1,467
@ 1550 nm	1,4677
Mode Field Diameter	
@ 1310 nm	8,6±0,4 µm
@ 1550 nm	9,65±0,5 µm
Cut-Off Wavelength (λ_{cc})	≤ 1260 nm
PMD Individual Fiber	< 0,2 ps/√km
Tensile Proof Test	100 kpsi (0,69 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Macrobending 1 turn, 5 mm, @ 1550 nm	≤ 0,10 dB
Macrobending 1 turn, 5 mm, @ 1625 nm	≤ 0,30dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.654 Single-Mode Optical Fibre Specifications

Corning® SMF-28e+® ULL Optical Fiber	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter (Uncoloured)	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm
Attenuation – Loose Tube Cables	
@ 1310 nm maximum	0,35 dB/km
@ 1550 nm maximum	0,21 dB/km
@ 1625 nm maximum	0,23 dB/km
Dispersion	
@ 1550 nm	≤ 18 ps/nm.km
@ 1625 nm	≤ 22 ps/nm.km
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1300 – 1324 nm
Zero Dispersion Slope (S_0)	≤ 0,092 ps/nm^2 km
Group Refractive Index	
@ 1310 nm	1,4606
@ 1550 nm	1,462
Mode Field Diameter	
@ 1310 nm	9,2±0,5 µm
@ 1550 nm	10,5±0,5 µm
Cut-Off Wavelength (λ_{cc})	≤ 1260 nm
PMD Individual Fiber	< 0,1 ps/√km
Tensile Proof Test	100 kpsi (0,69 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Wet, 14-day room temperature	3N
Macrobending 100 turns, 60 mm, @ 1625 nm	≤ 0,05 dB
Macrobending 100 turns, 50 mm, @ 1550 nm	≤ 0,05 dB
Macrobending 100 turns, 50 mm, @ 1310 nm	≤ 0,05 dB
Macrobending 1 turn, 32 mm, @ 1550 nm	≤ 0,1 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

G.655 NZDSF Single-Mode Optical Fibre Specifications

Corning® LEAF® Optical Fiber	
Cladding Diameter	125,0 ± 0,7 µm
Cladding Non-Circularity	≤ 0,7%
Core/Cladding Concentricity	≤ 0,5 µm
Coating Diameter (Uncoloured)	242 ± 5 µm
Coating –Cladding Concentricity	≤ 12 µm Attenuation – Loose Tube Cables
@ 1550 nm (typical / maximum)	0,25 / 0,30 dB/km
@ 1625 nm (typical / maximum)	0,27 / 0,34 dB/km Attenuation – Tight Buffer Cables
@ 1550 nm (typical / maximum)	0,25 / 0,35 dB/km
@ 1625 nm (typical / maximum)	0,27 / 0,40 dB/km
Dispersion	
@ 1530 nm	2,0-5,5 ps/nm.km
@ 1565 nm	4,5-6,0 ps/nm.km
@ 1625 nm	5,8-11,2 ps/nm.km
Chromatic Dispersion	
@ 1550 nm	4 ps/nm.km
@ 1625 nm	10 ps/nm.km
Group Refractive Index	
@ 1550 nm	1,468
@ 1625 nm	1,469
Mode Field Diameter	
@ 1550 nm	9,6±0,4 µm
Effective area @ 1550 nm	72 μm^2 @1550 nm
PMD Individual Fiber	< 0,1 ps/√km
Tensile Proof Test	100 kpsi (0,69 GPa)
Fiber Curl	≥4,0 m radius
Coating Strip Force	
Dry	3N
Wet, 14-day room temperature	3N
Macrobending 100 turns, 60 mm, @ 1625 nm	≤ 0,05 dB
Macrobending 100 turns, 50 mm, @ 1550 nm	≤ 0,05 dB
Macrobending 1 turn, 32 mm, @ 1550 nm	≤ 0,5 dB
Macrobending 1 turn, 32 mm, @ 1625 nm	≤ 0,5 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.1dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

Multi-Mode Fibres

OM1 62.5/125 Multi-Mode Optical Fibre Specifications

OFS Laser Optimized MM Fiber OM1+	
Core Diameter	62,5 ± 2,5 µm
Core Non-Circularity	≤ 5%
Cladding Diameter	125,0 ± 1,0 µm
Cladding Non-Circularity	≤ 1,0 %
Core/Cladding Concentricity Error (Offset)	≤ 1,0 µm
Coating Diameter (Coloured)	247-260 µm
Coating –Cladding Concentricity Error (Offset)	≤ 8 µm
Attenuation – Loose Tube Cables	
@ 850 nm (typical / maximum)	2,6 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,5 / 1,5 dB/km
Attenuation – Tight Buffer Cables	
@ 850 nm (typical / maximum)	2,6 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,5 / 1,5 dB/km
Group Refractive Index	
@ 850 nm	1,496
@ 1300 nm	1,491
Backscatter Coefficient	
@ 850 nm	-64,8 dB
@ 1300 nm	-72,1 dB
Bandwidth (overfilled launch)	
@ 850 nm	≥ 220 MHz-km
@ 1300 nm	≥ 500 MHz-km
Numerical Aperture	0,20 ± 0,015
Transmission Distance (Link Length)	
Gigabit Ethernet 850 nm	300 meters
Gigabit Ethernet 1300 nm	550 meters
Chromatic Dispersion	
Zero Dispersion Wavelength (λ_0)	1320 – 1365 nm
Zero Dispersion Slope (S_0)	≤ 0.11 ps/nm^2-km
(1320 ≤ λ_0 ≤ 1348 nm)	
≤ 0.001 x (1458 – ë0)	
(1348 ≤ λ_0 ≤ 1365 nm)	
Tensile Proof Test	100 kpsi (0,69 GPa)
Coating Strip Force	0,9 – 4,4 N (2,7 N typical)
Macrobending 100 turns, 75 mm, @ 850 nm	≤ 0,5 dB
Macrobending 100 turns, 75 mm, @ 1300 nm	≤ 0,5 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.2dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

OM2 50/125 Multi-Mode Optical Fibre Specifications

OFS LaserWave® FLEX G+ Fiber			
	BW 500/500	**BW 500/800**	**BW 600/1200**
Core Diameter	50 ± 2,5 µm	50 ± 2,5 µm	50 ± 2,5 µm
Core Non-Circularity	≤ 5%	≤ 5%	≤ 5%
Cladding Diameter	125,0 ± 0,8 µm	125,0 ± 0,8 µm	125,0 ± 0,8 µm
Cladding Non-Circularity	≤ 1,0 %	≤ 1,0 %	≤ 1,0 %
Core/Cladding Concentricity Error (Offset)	≤ 1,0 µm	≤ 1,0 µm	≤ 1,0 µm
Coating Diameter (Coloured)	242±5 µm	242±5 µm	242±5 µm
Coating –Cladding Concentricity Error (Offset)	≤ 8 µm	≤ 8 µm	≤ 8 µm
Attenuation – Loose Tube Cables			
@ 850 nm (typical / maximum)	2,0 / 3,5 dB/km	2,0 / 3,5 dB/km	2,0 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,7 / 1,5 dB/km	0,7 / 1,5 dB/km	0,7 / 1,5 dB/km
Attenuation – Tight Buffer Cables			
@ 850 nm (typical / maximum)	2,5 / 3,5 dB/km	2,5 / 3,5 dB/km	2,5 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,5 / 1,5 dB/km	0,5 / 1,5 dB/km	0,5 / 1,5 dB/km
Group Refractive Index			
@ 850 nm	1,483	1,483	1,483
@ 1300 nm	1,479	1,479	1,479
Bandwidth (overfilled launch)			
@ 850 nm	≥ 500 MHz-km	≥ 500 MHz-km	≥ 600 MHz-km
@ 1300 nm	≥ 500 MHz-km	≥ 800 MHz-km	≥ 1200 MHz-km
Numerical Aperture	0,20 ± 0,010	0,20 ± 0,010	0,20 ± 0,010
Transmission Distance (Link Length)			
1G Ethernet 850 nm, Serial Laser 1000BASE-SX		550 meters	
1G Ethernet 1300 nm, Serial Laser 1000BASE-LX		550 meters	
1G Ethernet 1300 nm, Based on IEEE 10Gbps model where EMB ≥ 600 MHz/km			750 meters
1G Ethernet 1300 nm, Based on IEEE 10Gbps model where OFL ≥ 1200 MHz/km			2000 meters
Tensile Proof Test	100 kpsi (0,69 GPa)	100 kpsi (0,69 GPa)	100 kpsi (0,69 GPa)
Coating Strip Force	0,9 – 4,4 N (2,7 N typical)	0,9 – 4,4 N (2,7 N typical)	0,9 – 4,4 N (2,7 N typical)
Macrobending 100 turns, 37,5 mm, @ 850 nm	≤ 0,5 dB	≤ 0,5 dB	≤ 0,5 dB
Macrobending 100 turns, 37,5 mm, @ 1300 nm	≤ 0,5 dB	≤ 0,5 dB	≤ 0,5 dB
Macrobending 2 turn, 15 mm, @ 850 nm	≤ 0,1 dB	≤ 0,1 dB	≤ 0,1 dB
Macrobending 2 turn, 15 mm, @ 1300 nm	≤ 0,3 dB	≤ 0,3 dB	≤ 0,3 dB
Macrobending 2 turn, 7,5 mm, @ 850 nm	≤ 0,2 dB	≤ 0,2 dB	≤ 0,2 dB
Macrobending 2 turn, 7,5 mm, @ 1300 nm	≤ 0,5 dB	≤ 0,5 dB	≤ 0,5 dB

*Values for cabled fibre, local attenuation discontinuity ≤0.2dB
Note: Due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.

OM3 50/125 Multi-Mode Optical Fibre Specifications

OFS LaserWave® FLEX G+ Fiber	
	OM3
Core Diameter	50 ± 2,5 µm
Core Non-Circularity	≤ 5%
Cladding Diameter	125,0 ± 0,8 µm
Cladding Non-Circularity	≤ 0,7 %
Core/Cladding Concentricity Error (Offset	≤ 1,0 µm
Coating Diameter (Coloured)	247-260 µm
Coating –Cladding Concentricity Error (Offset)	≤ 8 µm
Attenuation – Loose Tube Cables	
@ 850 nm (typical / maximum)	2,0 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,5 / 1,5 dB/km
Attenuation – Tight Buffer Cables	
@ 850 nm (typical / maximum)	2,1 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,7 / 1,5 dB/km
Zero Dispersion Wavelength (λ0) Zero Dispersion Slope (S0)	1295 – 1315 nm ≤ 0,101 ps/nm^2 km
Group Refractive Index	
@ 850 nm	1,483
@ 1300 nm	1,479
Backscatter Coefficient	
@ 850 nm	-68,4 dB
@ 1300 nm	-75,8 dB
Laser Bandwidth/EMB	
@ 850 nm	2000 MHz-km
@ 1300 nm	500 MHz-km
Overfilled @850 nm	1500 MHz-km
Overfilled @1300 nm	500 MHz-km
Numerical Aperture	0,200 ± 0,010
Transmission Distance (Link Length)	
100G Ethernet 850 nm (100GBASE-SR10)	140 meters[1]
40G Ethernet 850 nm (40GBASE-SR4)	140 meters[1]
10G Ethernet 850 nm (10GBASE-S)	300 meters
10G Ethernet 1310 nm CWDM lasers (10GBASE-LX4)	300 meters
10G Ethernet 1310 nm serial w/EDC (10GBASE-LRM)	220 meters
1G Ethernet 850 nm (1000GBASE-SX)	1000 meters[2]
1G Ethernet 1310 nm (1000GBASE-LX)	600 meters
Tensile Proof Test	100 kpsi (0,69 GPa)
Coating Strip Force	0,9 – 4,4 N (2,7 N typical)
Macrobending 100 turns, 37,5 mm, @ 850 nm	≤ 0,5 dB
Macrobending 100 turns, 37,5 mm, @ 1300 nm	≤ 0,5 dB
Macrobending 2 turn, 15 mm, @ 850 nm	≤ 0,1 dB
Macrobending 2 turn, 15 mm, @ 1300 nm	≤ 0,3 dB
Macrobending 2 turn, 7,5 mm, @ 850 nm	≤ 0,2 dB
Macrobending 2 turn, 7,5 mm, @ 1300 nm	≤ 0,5 dB

Values are valid for cabled fibre, local attenuation discontinuity ≤0,2 dB
Note: due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.
1) Distances assume maximum 1.0 dB total splice/connector loss, maximum 3.0 dB/km cable attenuation at 850 nm, and VCSEL spectral width of ≤ 0.45 nm. 100 Meter reach over OM3 and 150 meter reach over OM4 as defined by IEEE 802.3ba.
2) 1000-meter reach assuming total connection plus splice loss of 0.9 dB.
3)550 meter reach assuming 3.5 dB/Km maximum cabled attenuation at 850 nm plus 1.0 dB of total connection and plice loss, or 3.0 dB maximum cabled Attenuation at 850 nm and 1.3 dB total connection and splice loss. 400 meter reach as defined by IEEE 802.3ae.

OM4 50/125 Multi-Mode Optical Fibre Specifications

OFS LaserWave® FLEX G+ Fiber	
	OM4
Core Diameter	50 ± 2,5 µm
Core Non-Circularity	≤ 5%
Cladding Diameter	125,0 ± 0,8 µm
Cladding Non-Circularity	≤ 0,7 %
Core/Cladding Concentricity Error (Offset	≤ 1,0 µm
Coating Diameter (Coloured)	247-260 µm
Coating –Cladding Concentricity Error (Offset)	≤ 8 µm
Attenuation – Loose Tube Cables	
@ 850 nm (typical / maximum)	2,0 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,5 / 1,5 dB/km
Attenuation – Tight Buffer Cables	
@ 850 nm (typical / maximum)	2,1 / 3,5 dB/km
@ 1300 nm (typical / maximum)	0,7 / 1,5 dB/km
Zero Dispersion Wavelength (λ0) Zero Dispersion Slope (S0)	1295 – 1315 nm ≤ 0,101 ps/nm^2 km
Group Refractive Index	
@ 850 nm	1,483
@ 1300 nm	1,479
Backscatter Coefficient	
@ 850 nm	-68,4 dB
@ 1300 nm	-75,8 dB
Laser Bandwidth/EMB	
@ 850 nm	4700 MHz-km
@ 1300 nm	500 MHz-km
Overfilled @850 nm	3500 MHz-km
Overfilled @1300 nm	500 MHz-km
Numerical Aperture	0,200 ± 0,010
Transmission Distance (Link Length)	
100G Ethernet 850 nm (100GBASE-SR10)	190 meters[1]
40G Ethernet 850 nm (40GBASE-SR4)	190 meters[1]
10G Ethernet 850 nm (10GBASE-S)	550[3] meters
10G Ethernet 1310 nm CWDM lasers (10GBASE-LX4)	300 meters
10G Ethernet 1310 nm serial w/EDC (10GBASE-LRM)	220 meters
1G Ethernet 850 nm (1000GBASE-SX)	1040 meters
1G Ethernet 1310 nm (1000GBASE-LX)	600 meters
Tensile Proof Test	100 kpsi (0,69 GPa)
Coating Strip Force	0,9 – 4,4 N (2,7 N typical)
Macrobending 100 turns, 37,5 mm, @ 850 nm	≤ 0,5 dB
Macrobending 100 turns, 37,5 mm, @ 1300 nm	≤ 0,5 dB
Macrobending 2 turn, 15 mm, @ 850 nm	≤ 0,1 dB
Macrobending 2 turn, 15 mm, @ 1300 nm	≤ 0,3 dB
Macrobending 2 turn, 7,5 mm, @ 850 nm	≤ 0,2 dB
Macrobending 2 turn, 7,5 mm, @ 1300 nm	≤ 0,5 dB

Values are valid for cabled fibre, local attenuation discontinuity ≤0,2 dB
Note: due to OTDR measurement uncertainty B3 International cannot guarantee attenuation values at fibres shorter than 1000m.
3) Distances assume maximum 1.0 dB total splice/connector loss, maximum 3.0 dB/km cable attenuation at 850 nm, and VCSEL spectral width of ≤ 0.45 nm. 100 Meter reach over OM3 and 150 meter reach over OM4 as defined by IEEE 802.3ba.
4) 1000-meter reach assuming total connection plus splice loss of 0.9 dB.
3)550 meter reach assuming 3.5 dB/Km maximum cabled attenuation at 850 nm plus 1.0 dB of total connection and plice loss, or 3.0 dB maximum cabled Attenuation at 850 nm and 1.3 dB total connection and splice loss. 400 meter reach as defined by IEEE 802.3ae.

Colour Coding

Colour Coding – Fibre

Fibre	IEC 60304 (Standard)		TIA/EIA 598	
	Tight Buffered	Loose Tube	Tight Buffered	Loose Tube
1	Red	Red	Blue	Blue
2	Green	Green	Orange	Orange
3	Blue	Blue	Green	Green
4	Yellow	Yellow	Brownro	Brown
5	White	White	Grey	Grey
6	Grey	Grey	White	White
7	Brown	Brown	Red	Red
8	Violet	Violet	Black	Black
9	Aqua	Aqua	Yellow	Yellow
10	Black	Black	Violet	Violet
11	Orange	Orange	Pink	Pink
12	Pink	Pink	Aqua	Aqua
13	Red + black Ring	Red + black Ring	Blue + black Ring	Blue + black Ring
14	Green + black	Green + black Ring	Orange + black	Orange + black
15	Blue + black Ring	Blue + black Ring	Green + black	Green + black Ring
16	Yellow + black	Yellow + black Ring	Brown + black	Brown + black Ring
17	White + black	White + black Ring	Grey + black Ring	Grey + black Ring
18	Grey + black Ring	Grey + black Ring	White + black Ring	White + black Ring
19	Brown + black	Brown + black Ring	Red + black Ring	Red + black Ring
20	Violet + black	Violet + black Ring	Black + white Ring	Natur + black Ring
21	Aqua + black	Aqua + black Ring	Yellow + black	Yellow + black Ring
22	Black + white Ring	Natur + black Ring	Violet + black Ring	Violet + black Ring
23	Orange + black	Orange + black Ring	Pink + black Ring	Pink + black Ring
24	Pink + black Ring	Pink + black Ring	Aqua + black	Aqua + black Ring

Colour Coding – Tubes

Loose Tube Cables – Tube Colours	
Tube 1	Red
Tube 2	Green
Remaining Tubes & Mono Loose Tube	White/Nature

*Note: Other colour sequences available upon request.

Colour Coding Breakout Cables

Fibre Colour	Buffer Colour	Sub Unit Sheath Colour	Sub Unit Identification
Nature	Nature	As per Fibre type (Yellow, Orange, Turquoise, Purple or Black)	Each simplex printed with sequential numbers

Sheath & Print Legend Colours

Cable Type	Fibre Type	Sheath Colour	Print Legend Colour
Loose Tube Cables	All types	Black	White
Tight Buffered Cables	SM 9/125	Yellow	Black
	OM1	Orange	Black
	OM2	Orange	Black
	OM3	Turquoise	Black
	OM4	Purple	Black

General Manufacturing Standards for Fibre Optical Cables

Manufacturing Standards for Fibre Optical Cables

The fibre optical cables which B3 International offers are manufactured and tested according to international standards as follows:

IEC 60793-1	Optical fibre Part 1: Generic specifications
IEC 60793-2	Optical fibre Part 2: Product specifications
IEC 60794-1	Optical fibre cables-part 1 Outdoor cables- sectional specification
IEC 60794-2	Optical fibre cables-part 2 indoor cables- sectional specification
TIA/EIA 598 B	Colour code of fibre optic cables
IEC60304	
ITU-T G.650	Definition and test methods for the relevant parameters of single-mode fibres
ITU-T G.651	Characteristics of multimode graded index optical fiber cable
ITU-T G.652	Characteristics of a single-mode optical fibre cable
ITU-T G.655	Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable
ITU-T G.657	Characteristics of a bending-loss insensitive single-mode optical fibre cable

Test Requirements

Approved by various professional optical and communication product institution, B3 International also conduct various in-house testing in its own Laboratory and Test Centre.

The cable manufactured is in accordance with applicable international standards. The following tests are carried out according to corresponding reference.

Routine Tests of Optical Fibre

No:	Item:	Reference:
1	Mode field diameter	IEC 60793-1-45
2	Core/clad concentricity	IEC 60793-1-20
3	Cladding diameter	IEC 60793-1-20
4	Cladding non-circularity	IEC 60793-1-20
5	Coating Diameter	IEC 60793-1-21
6	Attenuation coefficient	IEC 60793-1-40
7	Chromatic dispersion	IEC 60793-1-42
8	Cable cut-off wavelength	IEC 60793-1-44

General Test for Fibre Optical Cables

Test:	Reference:	
Tension	Test standard	IEC 60794-1 Method: E1
	Sample length	No less than 50 meters
	Load	Max. tensile load
	Duration	10 minutes
	Test	Measuring additional attenuation under load and after release.
Abrasion	Test standard	IEC 60794-1 Method:E3
	Plate size	100mmx100mm with 5mm edges
	Load	1-10KN
	Duration	1 minutes
	Test number	3
	Distance Between Tests	500mm without turning the cable
	Test	Measuring additional attenuation under load
Impact	Test standard	IEC 60794-1 Method:E4
	Impact energy	1-56Nm
	Impact points	3
	Distance Between Tests	Min. 500mm
	Test results	Measuring additional attenuation under load
Repeated bending	Test standard	IEC 60794-1 Method:E6
	Sample length	>1m
	Bending radius	20*D
	Cycles	500
	Test	Additional attenuation meassured.
Torsion	Test standard	IEC 60794-1 Method:E7
	Sample length	>1m
	Angles	10/180 degree
	Cycles	10, 360, 720 degree
	Load	5Kg
	Test	Measuring additional attenuation under load
Bending	Test standard	IEC 60794-1 Method:E11
	Mandrel diameter	70,80,100mm
	Turn number	4
	Cycles	3
	Temperature	20°C
	Test	Additional attenuation meassured.

Temperature Cycling	Test standard	IEC 60794-1 Method: F1
	Temp Range	-40 to +70
	No of Days	7
	Daiameter lay out	Ca 1m
	No of fibres	1+1
	Test	Additional attenuation measured during temp cycle
Water Penetration	Test standard	IEC 60794-1 Method: F5 A or B
	Length	1 to 3m Cable, Sealead at one end.
	Water	1m Height
	Time	24h
	Test	No water leaks are detected from the exposed cable end.

Halogen Free – Acid Gases evolved during Combustion

This test procedure provides information if the insulation material of the cable sheath creates corrosive gases in the event of fire.

IEC 60754-1, EN 50267-2-1 test procedure:
Between 0.5 and 1g of material is placed into a tube furnace. Over a period of 40 minutes, the temperature inside of the tube furnace is steady increased to 800°C, the temperature is then maintained for a further 20 minutes. The gases produced are absorbed into a defined catch solution, which is later made up to one litre and then analysed.

IEC 60754-2, EN 50267-2-2 test procedure:
1g±0.005g of material is placed into a tube furnace. The temperature inside of the tube furnace where the sample sits is 935°C, the specimen remains in the tube furnace for a period of 30 minutes. The gases produced are absorbed into a defined catch solution, which is later made up to one litre and then analysed.

Limits:
pH value ≥ 4.3
The conductivity is < 10mS/mm

Vertical Flame Single Wire

This test details a method of test for the assessment of the flame propagation characteristics of a single wire or cable.

IEC/ BS EN 60332-1 test procedure:
A 60cm cable sample is fixed vertically inside a metallic box and a flame about 175mm long with an inner blue cone about 55mm long is applied at an angle of 45° from a propane burner placed at 450mm from the top at the upper portion. The top of the bottom clamp and the bottom of the top clamp is 550±25 mm.
The flame must extinguish itself, the charred or affected position does not reach to 425mm above the point of flame application.

Vertical Flame Spread of Vertically Bunched Wires or Cables

The various parts of IEC / BS EN 60332 specify methods of test for flame spread along cabling. It is particularly important to assess the flame spread properties of cabling since cables cross fire resistant walls, linking occupied spaces to service areas, ceiling voids, etc. Fire spread has been linked to cables in a number of major fires

A cable specimen, consisting of number of 3.5m length of cables are fixed to a vertical ladder tray where they are applied with one or two flame from a ribbon-type propane gas burner for a specified times under controlled air flow. Four categories (A, B, C & D) are defined and distinguished by test duration and the volume of non-metallic material of the sample under test.

- IEC 60332-3-22 Category A test procedure:
Category A relates only to cables installed on the test ladder to achieve a nominal total volume of non-metallic material of 7 l/m of test sample.
The test flame shall be applied for 40min.

- IEC 60332-3-23 Category B test procedure:
Category B relates only to cables installed on the test ladder to achieve a nominal total volume of non-metallic material of 3.5 l/m of test sample.
The test flame shall be applied for 40min.

- IEC 60332-3-24 Category C test procedure:
The total number of test pieces shall be that number required to provide a nominal total volume of non-metallic material of 1.5 l/m of test sample.
The test flame shall be applied for 20min.

- IEC 60332-3-25 Category D test procedure:
Category D relates only to small cables of overall diameter 12mm or smaller and cross-section of 35mm2 or smaller installed on the test ladder to achieve a nominal total volume of non-metallic material of 0.5 l/m of test sample.
The test flame shall be applied for 20min.

After burning has ceased, the extent of charred or affected portion does not reach a height exceeding 2.5m above the bottom edge of the burner.

Smoke Density
The smoke density measurement taken from a material under fire conditions gives an indication of the visibility through the smoke, this is important as reduced visibility in a real fire situation makes it more difficult to escape from a fire hence increasing the threat to human life from the toxic gases, flames and heat.

IEC 61034 Test procedure:
The test is performed inside a chamber measuring 3 m by 3 m by 3 m.

Specimens are placed onto the specimen stand and an alcohol fuel source is placed below it. At the start of the test the fuel is ignited. The test duration is 40 minutes.

The test is performed by monitoring the transmittance reduction of a white light beam, running from one side of the chamber to the other at a set height, thus monitoring the build up of smoke inside the chamber.

A minimum light transmittance of ≥ 60% is applied in order to classify a cable as low smoke

1. RoHS test

This test serves to identify if any restricted substances as per EU directive 2011/65/EU exist in the product.

Allowed concentration values:

Substance	MCV, Maximum Concentration Values	
Lead 0.1 % of the weight	1000 mg/kg	1000 ppm
Mercury 0.1 % of the weight	1000 mg/kg	1000 ppm
Cadmium 0.01 % of the weight	100 mg/kg	100 ppm
Chrom VI 0,1 % of the weight	1000 mg/kg	1000 ppm
PBB/PBDE 0,1 % of the weight	1000 mg/kg	1000 ppm

Sheath Chemical Resistance Reference Table

	LDPE	HDPE	PA	HFFR	PUR
Acids, Dilute or Weak	E	E	F	N	G
Acids*, Strong or Concentrated	E	E	N	N	F
Alcohols, Aliphatic	E	E	N	N	F
Aldehydes	G	G	F	F	G
Bases	E	E	F	G	N
Esters	G	G	E	N	N
Hydrocarbons, Aliphatic	F	G	E	F	E
Hydrocarbons, Aromatic	F	G	E	N	N
Hydrocarbons, Halogenated	N	F	G	N	N
Ketones	G	G	E	N	N
Oxidizing Agents, Strong	F	F	N	N	N
Salts	E	E	E	G	E
Crude Oil	N	N	G	F	F
Kerosene	F	F	E	N	F
Mineral Oil	G	G	E	N	F

*This table to be treated as reference only.

E **Excellent -** 30 days of constant exposure causes no damage. Plastic may tolerate for years.

G **Good -** Little or no damage after 30 days of constant exposure to the reagent.

F **Fair -** Some effect after 7 days of constant exposure to the reagent. The effect may be crazing, cracking, loss of strength or discoloration, depending on the plastic.

N **Not recommended -** Immediate damage may occur. Depending on the plastic, the effect may be severe crazing, cracking, loss of strength, discoloration deformation, dissolution or permeation loss.

Cable Sheath Properties

	MDPE	HDPE	PA	HFFR	PUR
Flexibility	Medium	Low	Low	High	Very High
Water Resistance	High	High	Medium	Medium	Medium
Abrasion Resistance	High	High	High	Low	High
UV Radiation Resistance	High	High	Low	High	High
Brittleness in Low Temperature	Medium	Medium	Low	Medium	Very Low