



# **Technical Specifications**

**For**

## **Air Blown Fiber Unit**

**(ITU-T G.652.D/G.657A1/G.657A2, OM1/OM3/OM4 Fibers)**



## Technical Specifications for Optical Fiber Cable

### 1. General

1.1 This specification covers the requirements of the enhanced performance fiber unit to be supplied to customer for installation by blowing.

1.2 The optical fiber cable shall comply with the requirements of this specification and generally meet or better latest standards:

ITU-T G.650: Definitions and test methods for linear, deterministic attributes of single-mode fiber and cable

ITU-T G.652.D: Characteristics of a single-mode optical fiber and cable

ITU-T G.657: Characteristics of a bending loss insensitive single mode optical fiber and cable for the access network

IEC 60793-2-50 B1.3: Sectional specification for class B single mode fibers

IEC 60793-2-10 A1: Sectional specification for category A1 multimode fibers

IEC 60794-1-2: Optical Fiber Cables, Part 1-2, Generic Specifications-Basic optical cable test procedures  
General guidance

IEC 60794-1-21: Optical fiber cables, Part 1-21, Generic specification - Basic optical cable test procedures -  
Mechanical tests methods

IEC 60794-1-22: Optical fiber cables, Part 1-22, Generic specification - Basic optical cable test procedures -  
Environmental test methods

### 2. Optical Fiber Characteristics

The optical, geometrical, mechanical and environment characteristics of the ITU-T G.652.D optical fiber shall be accordance with below table:

Characteristics		Specified Values	Units
<b>Optical Characteristics</b>			
Mode field diameter	at 1310nm	9.2±0.4	μm
	at 1550nm	10.4 ± 0.6	μm
Attenuation coefficient	at 1310nm	≤0.40	dB/km
	at 1550nm	≤0.30	dB/km
Zero dispersion wavelength ( $\lambda_0$ )		1300 ~ 1324	nm
Max zero dispersion slope ( $S_{0max}$ )		≤0.092	ps/(nm <sup>2</sup> ·km)
Polarization mode dispersion coefficient (PMD <sub>Q</sub> )		≤0.2	ps / $\sqrt{km}$
Cut-off wavelength ( $\lambda_{cc}$ )		≤1260	nm
Dispersion coefficient	1285~1330nm	≤3.5	ps/(nm·km)
	1550nm	≤18	ps/(nm·km)
Effective group index of	at 1310nm	1.466	—



refraction ( $N_{eff}$ )	at 1550nm	1.467	—
<b>Geometric characteristic</b>			
Cladding diameter		125.0±1.0	μm
Cladding non-circularity		≤1.0	%
Coating diameter		245.0±10.0	μm
Coating-cladding concentricity error		≤12.0	μm
Coating non-circularity		≤6.0	%
Core-cladding concentricity error		≤0.8	μm
<b>Mechanical characteristic</b>			
Curling		≥4	m
Proof stress		≥0.69	GPa
Coating strip force	Average value	1.0-5.0	N
	Peak value	1.3-8.9	N
Macro bending loss	Φ60mm, 100 circles, at 1550nm	≤0.05	dB
	Φ32mm, 1 circles, at 1550nm	≤0.05	dB

The optical, geometrical, mechanical and environment characteristics of the ITU-T G.657A1 optical fiber shall be accordance with below table:

Characteristics		Specified Values	Units
<b>Optical Characteristics</b>			
Mode field diameter	at 1310nm	8.6±0.6	μm
	at 1550nm	9.8 ± 0.8	μm
Attenuation coefficient	at 1310nm	≤0.40	dB/km
	at 1550nm	≤0.30	dB/km
Zero dispersion wavelength ( $\lambda_0$ )		1300 ~ 1324	nm
Max zero dispersion slope ( $S_{0max}$ )		≤0.092	ps/(nm <sup>2</sup> ·km)
Polarization mode dispersion coefficient ( $PMD_Q$ )		≤0.2	ps / $\sqrt{km}$
Cut-off wavelength ( $\lambda_{cc}$ )		≤1260	nm
Effective group index of refraction ( $N_{eff}$ )	at 1310nm	1.466	—
	at 1550nm	1.467	—
<b>Geometric characteristic</b>			
Cladding diameter		125.0±1.0	μm
Cladding non-circularity		≤1.0	%
Coating diameter		245.0±10.0	μm
Coating-cladding concentricity error		≤12.0	μm
Coating non-circularity		≤6.0	%
Core-cladding concentricity error		≤0.8	μm
<b>Mechanical characteristic</b>			
Curling		≥4	m
Proof stress		≥0.69	GPa
Coating strip force	Average value	1.0-5.0	N



	Peak value		1.3-8.9	N
Macro bending loss	Φ20mm, 1 circles	at 1550nm	≤0.75	dB
		at 1625nm	≤1.5	dB
	Φ30mm, 10 circles	at 1550nm	≤0.25	dB
		at 1625nm	≤1.0	dB

The optical, geometrical, mechanical and environment characteristics of the ITU-T G.657A2 optical fiber shall be accordance with below table:

Characteristics		Specified Values	Units	
<b>Optical Characteristics</b>				
Mode field diameter	at 1310nm		8.7±0.6	μm
	at 1550nm		9.8 ± 0.8	μm
Attenuation coefficient	at 1310nm		≤0.40	dB/km
	at 1550nm		≤0.30	dB/km
Zero dispersion wavelength (λ <sub>0</sub> )		1300 ~ 1324	nm	
Max zero dispersion slope (S <sub>0max</sub> )		≤0.092	ps/(nm <sup>2</sup> ·km)	
Polarization mode dispersion coefficient (PMD <sub>Q</sub> )		≤0.2	ps / √km	
Cut-off wavelength (λ <sub>cc</sub> )		≤1260	nm	
Effective group index of refraction (N <sub>eff</sub> )	at 1310nm		1.466	—
	at 1550nm		1.467	—
<b>Geometric characteristic</b>				
Cladding diameter		125.0±1.0	μm	
Cladding non-circularity		≤1.0	%	
Coating diameter		245.0±10.0	μm	
Coating-cladding concentricity error		≤12.0	μm	
Coating non-circularity		≤6.0	%	
Core-cladding concentricity error		≤0.8	μm	
<b>Mechanical characteristic</b>				
Curling		≥4	m	
Proof stress		≥0.69	GPa	
Coating strip force	Average value		1.0-5.0	N
	Peak value		1.3-8.9	N
Macro bending loss	Φ30mm, 10 circles	at 1550nm	≤0.03	dB
		at 1625nm	≤0.1	dB
	Φ20mm, 1 circles	at 1550nm	≤0.1	dB
		at 1625nm	≤0.2	dB
	Φ15mm, 1 circles	at 1550nm	≤0.5	dB
		at 1625nm	≤1.0	dB

The optical, geometrical, mechanical and environment characteristics of the OM1 (62.5/125) optical fiber shall be accordance with below table:

Characteristics	Specified Values	Units
-----------------	------------------	-------



<b>Optical Characteristics</b>			
Attenuation coefficient	at 850nm	$\leq 3.5$	dB/km
	at 1300nm	$\leq 1.5$	dB/km
Bandwidth (OFL)	@ 850nm	$\geq 200$	MHz.km
	@ 1300nm	$\geq 500$	MHz.km
Attenuation non-uniformity		$\leq 0.1$	dB
Zero dispersion wavelength ( $\lambda_0$ )		1320 ~ 1365	nm
Dispersion coefficient	@ 1295 ~ 1310nm	$\leq 0.11$	ps/(nm·km)
	@ 1310-1340nm	$\leq 0.001 (1458-\lambda_0)$	ps/(nm·km)
Effective group index of refraction ( $N_{eff}$ )	at 850nm	1.496	—
	at 1300nm	1.491	—
Numerical aperture		$0.275 \pm 0.015$	—
<b>Geometric characteristic</b>			
Core diameter		$62.5 \pm 2.5$	$\mu\text{m}$
Core non-circularity		$\leq 5.0$	%
Cladding diameter		$125.0 \pm 1.0$	$\mu\text{m}$
Cladding non-circularity		$\leq 1.0$	%
Coating diameter		$245 \pm 10.0$	$\mu\text{m}$
Coating-cladding concentricity error		$\leq 12.0$	$\mu\text{m}$
Coating non-circularity		$\leq 6.0$	%
Core-cladding concentricity error		$\leq 1.5$	$\mu\text{m}$
<b>Mechanical characteristic</b>			
Proof stress		$\geq 0.69$	GPa
Coating strip force	Average value	1.0-5.0	N
	Peak value	1.3-8.9	N
Macro bending loss	$\Phi 75\text{mm}$ , 100 circles, at 850nm	$\leq 0.5$	dB
	$\Phi 75\text{mm}$ , 100 circles, at 1300nm	$\leq 0.5$	dB

The optical, geometrical, mechanical and environment characteristics of the OM3 optical fiber shall be accordance with below table:

Characteristics		Specified Values	Units
<b>Optical Characteristics</b>			
Attenuation coefficient	at 850nm	$\leq 3.5$	dB/km
	at 1300nm	$\leq 1.5$	dB/km
Bandwidth (OFL)	@ 850nm	$\geq 1500$	MHz.km
	@ 1300nm	$\geq 500$	MHz.km
Attenuation non-uniformity		$\leq 0.1$	dB
Zero dispersion wavelength ( $\lambda_0$ )		1295 ~ 1340	nm
Dispersion coefficient	@ 1295 ~ 1310nm	$\leq 0.105$	ps/(nm·km)
	@ 1310-1340nm	$\leq 375 \times (1590-\lambda_0) \times 10^{-6}$	ps/(nm·km)
Effective group index of		at 850nm	1.482



refraction ( $N_{eff}$ )	at 1300nm	1.477	—
Numerical aperture		0.20± 0.015	—
<b>Geometric characteristic</b>			
Core diameter		50 ± 2.5	μm
Core non-circularity		≤5.0	%
Cladding diameter		125.0±1.0	μm
Cladding non-circularity		≤1.0	%
Coating diameter		245±10.0	μm
Coating-cladding concentricity error		≤10.0	μm
Coating non-circularity		≤6.0	%
Core-cladding concentricity error		≤1.0	μm
<b>Mechanical characteristic</b>			
Proof stress		≥0.69	GPa
Coating strip force	Average value	1.0-5.0	N
	Peak value	1.3-8.9	N
Macro bending loss	Φ30mm, 2 circles, at 1300nm	≤1.0	dB

The optical, geometrical, mechanical and environment characteristics of the OM4 optical fiber shall be accordance with below table:

Characteristics		Specified Values	Units
<b>Optical Characteristics</b>			
Attenuation coefficient	at 850nm	≤3.5	dB/km
	at 1300nm	≤1.5	dB/km
Bandwidth (OFL)	@ 850nm	≥3500	MHz.km
	@ 1300nm	≥500	MHz.km
Attenuation non-uniformity		≤0.1	dB
Zero dispersion wavelength ( $\lambda_0$ )		1295 ~ 1340	nm
Dispersion coefficient	@ 1295 ~ 1310nm	≤ 0.105	ps/(nm·km)
	@ 1310-1340nm	≤375 × (1590- $\lambda_0$ ) × 10 <sup>-6</sup>	ps/(nm·km)
Effective group index of refraction ( $N_{eff}$ )	at 850nm	1.482	—
	at 1300nm	1.477	—
Numerical aperture		0.200± 0.015	—
<b>Geometric characteristic</b>			
Core diameter		50 ± 2.5	μm
Core non-circularity		≤5.0	%
Cladding diameter		125.0±1.0	μm
Cladding non-circularity		≤1.0	%
Coating diameter		245±10.0	μm
Coating-cladding concentricity error		≤10.0	μm
Coating non-circularity		≤6.0	%
Core-cladding concentricity error		≤1.0	μm

Mechanical characteristic			
Proof stress		≥0.69	GPa
Coating strip force	Average value	1.0-5.0	N
	Peak value	1.3-8.9	N
Macro bending loss	Φ30mm, 2 circles, at 1300nm	≤1.0	dB

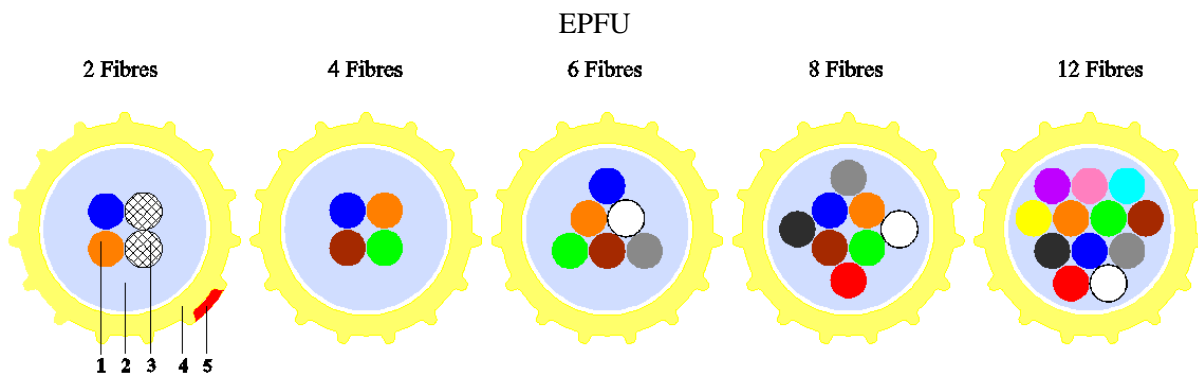
### 3. Characteristics of Cable

#### 3.1 Cable Construction and Parameter

The resin coated optical fibers, and outer sheath extruded on the tight buffer.

Items		Descriptions				
Optical fiber		2F	4F	6F	8F	12F
Outer sheath	Material	Natural HDPE				
Cable nominal diameter (±0.05mm)		1.15mm	1.15mm	1.35mm	1.55mm	1.65mm
Cable approx. weight (kg/km)		1.0	1.0	1.2	1.5	1.8
Max. tensile strength	Short time	W*G N				
Max. crush resistance	Short time	100N/100mm				
Minimum Bending radius	Dynamic	20 times of cable diameter				
	Static	10 times of cable diameter				
Temperature range	Installation	-10°C ~ +40°C				
	Storage	-20°C ~ +60°C				
	Operation	-20°C ~ +60°C				
Air Blowing	Equipment: PR140, Duct: 5/3.5mm, Blowing pressure: ≤10bar, Typical blowing length: 1000m					

#### 3.2 Cross-section of Cable



1. Optical fiber    2. Resin    3. +2 'Filled' Fibers    4. Groove    5. HDPE sheath

#### 4. Fiber and Loose Tube Color Identification

The individual fiber and loose tubes shall accordance with standard TIA/EIA-598-A and the color code as below.

**-2 fibers**

**Fiber Colors**



NO.	1	2	3	4								
Color	Blue	Orange	Filler	Filler								

-4 fibers

**Fiber Colors**

NO.	1	2	3	4								
Color	Blue	Orange	Green	Brown								

-6 fibers

**Fiber Colors**

NO.	1	2	3	4	5	6						
Color	Blue	Orange	Green	Brown	Gray	White						

-8 fibers

**Fiber Colors**

NO.	1	2	3	4	5	6	7	8				
Color	Blue	Orange	Green	Brown	Gray	White	Red	Black				

-12 fibers

**Fiber Colors**

NO.	1	2	3	4	5	6	7	8	9	10	11	12
Color	Blue	Orange	Green	Brown	Slate	White	Red	Black	Yellow	Purple	Pink	Aqua

**5. Mechanical and Environmental Test.**

Item	Details
Tensile loading test	Test Method: Accordance with IEC60794-1-21-E1 Tensile force : W*G N Length: 50m Holding time : 1 minutes Diameter of mandrel: 30 x cable diameter After test the fiber and cable no damage and no obvious change in attenuation
Crush / Compression test	Test Method: Accordance with IEC 60794-1-21-E3 Test Length: 100 mm Load: 100 N Holding time: 1 minutes Test result: Additional attenuation ≤0.1dB at 1550nm. After test no sheath cracking and no fiber breakage.
Cable bending test	Test Method: Accordance with IEC 60794-1-21-E11B Mandrel Diameter: 65mm Number of Cycle: 3 cycles



	Test result: Additional attenuation $\leq 0.1$ dB at 1550nm. After test no sheath cracking and no fiber breakage.
Flexing / Repeated Bending test	Test Method: Accordance with IEC 60794-1-21- E8/E6 Mass of the weight : 500g Bending diameter : 20 x diameter of cable Impact rate : $\leq 2$ sec / cycle Number of cycles : 20 Test result: Additional attenuation $\leq 0.1$ dB at 1550nm. After test no sheath cracking and no fiber breakage.
Temperature cycling test	Test Method: Accordance with IEC 60794-1-22-F1 Variation of temperature : $-20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ Number of cycles : 2 Holding time per each step : 12 hours Test result: Additional attenuation $\leq 0.1$ dB/km at 1550nm.

## 6. Cable Marking

Unless otherwise required the sheath will be use inkjet marked at intervals of 1m, containing:

- Customer name
- Manufacture's name
- Date of manufacture
- Type and number of fiber cores
- Length marking
- Other requirements

## 7. Environmentally

Full comply with **ISO14001, RoHS and OHSAS18001.**

## 8. Cable Packing

Free coiling in the pan.

Standard delivery lengths are 2km with a tolerance of  $-1\% \sim +3\%$ .

Fiber Count	Drum Length (m)	Drum Size $\Phi \times W$ (mm)	Weight (Gross) (kg)
2~4 Fibers	4000m	$\phi 510 \times 200$	10.0
	6000m	$\phi 510 \times 300$	13.0
6 Fibers	2000 m	$\phi 510 \times 200$	9.0
	4000 m	$\phi 510 \times 300$	12.0
8 Fibers	2000 m	$\phi 510 \times 200$	9.0
	4000 m	$\phi 510 \times 300$	14.0
12 Fibers	2000 m	$\phi 510 \times 200$	10.0
	4000 m	$\phi 510 \times 300$	15.0



—End of specifications—