



G.657A1



48F / 96F



250  $\mu$ m

## 1. GENERAL

This specification covers the design and performance of the single mode optical cables to be used in air blown micro duct application.

### 1.1 Cable description



48/96 G.657.A1 SM-fibers



Loose tubes SZ-stranded



Suitable for air blowing installation  
in micro-duct

### 1.2 Quality

Mainframe Communications ensures a continuing level of quality in our cable products through several programs including ISO 9001.

### 1.3 Lifetime

Mainframe Communications ensures product reliability through rigorous qualification testing of each product family. Both initial and periodic qualification testing are performed to assure the cable's performance and durability in the field environment.

### 1.4 Application

ITU-T G.657	Characteristics of a single-mode optical fiber
IEC 60794-1-1	Optical fiber cables- part1-1-Generic specification-General
IEC 60794-1-21	Optical fiber cables- part1-2-Generic specification-Basic optical cable test procedure-Mechanical test methods
IEC 60794-1-22	Optical fiber cables- part1-2-Generic specification-Basic optical cable test procedure-Environmental test methods
IEC 60794-3	Optical fiber cables- part3-Sectional specification- Outdoor cables
IEC 60794-5-10	Optical fibre cables –Part 5-10 Family specification for outdoor microduct optical and protected microducts for installation by blowing

### 1.5 Working condition

- ⊗ Transportation and storage temperature: -40°C ~ +70°C
- ⊗ Installation temperature: -10°C ~ +50°C
- ⊗ Operation temperature: -40°C ~ +70°C

### 1.6 Minimum Allowable Bending Radius

- ⊗ Static: 10D / Dynamic: 20D
- ⊗ D is the out diameter of the cable



## 1.7 Life time

Optical fiber cables supplied in compliance with the specifications can be capable of withstanding the typical service condition for a period of twenty-five (25) years without detriment to the transmission or operation and maintenance characteristics of the cable.

## 2. OPTICAL FIBER IN CABLE (ITU-G657)

Optical properties of the SM fiber are achieved through a germanium doped silica based core with a pure silica cladding which meets ITU-T G657, UV curable acrylate protective coating is applied over the glass cladding to provide the necessary maximum fiber lifetime.

Geometrical, optical, and mechanical characteristics of fiber in cable as the following table:

Category	Description	Specification	
		Before cable	After cable
<b>Geometrical Characteristics</b>	Cladding diameter	125.0±0.7 μm	
	Cladding non-circularity	≤ 0.7 %	
	Core concentricity error	≤ 0.5 μm	
	Coating diameter	235 ~ 255 μm (Before Colored) 250±15 μm (Colored)	
	Coating/cladding concentricity error	≤ 12.0 μm	
<b>Optical Characteristics</b>	Mode field diameter at 1310 nm	9.0±0.4 μm	
	Point discontinuity at 1310nm and 1550nm	≤ 0.5dB	
	Attenuation at 1310 nm	≤ 0.35 dB/km	≤ 0.36 dB/km
	Attenuation at 1383 nm	≤ 0.35dB	≤ 0.35 dB/km
	Attenuation at 1550 nm	≤ 0.21 dB/km	≤ 0.22 dB/km
	Zero dispersion wavelength	1300 ~ 1324 nm	
	Zero dispersion slope	≤0.092 ps/(nm <sup>2</sup> ·km)	
	Cable cut-off wavelength	≤ 1260 nm	
	Polarization mode dispersion individual fiber	≤ 0.2 ps/√km	
	Polarization mode dispersion design link value (M=20, Q=0.01%)	≤ 0.1 ps/√km	
	Macro-bend loss (10 turns, 15mm radius)	1550nm: ≤ 0.25 dB; 1625nm: ≤1.0 dB;	
Macro-bend loss (1 turn, 10mm radius)	1550nm: ≤ 0.75 dB; 1625nm: ≤ 1.5 dB;		

Category	Description	Specification	
		Before cable	After cable
Mechanical Specification	Proof stress level	≥100kpsi (0.69 GPa)	
	Coating strip force(peak value)	1.3~8.9N	
	Dynamic Fatigue Parameter (nd)	≥20	

## 3. OPTICAL CABLE

### 3.1 General design

Optical fibers are housed in loose tubes that are made of high-modulus plastic and filled with waterproof compounds.

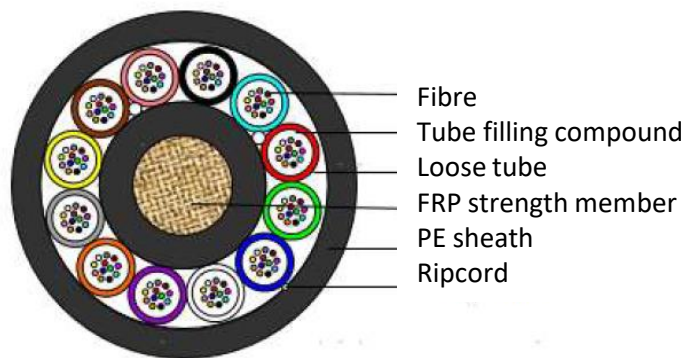
FRP is applied as central strength member.

Loose tubes are SZ-stranded around the strength member.

Water blocking yarns are used in and over the cable core to prevent it from water ingress.

Polyethylene sheath is applied over the cable core as the outer sheath.

### 3.2 Construction



GCYFY-144B6a1

### 3.3 Color code of the fiber

Each fiber can be identifiable throughout the length of the cable in accordance with the following color sequence.

	1	2	3	4	5	6
Fiber Color Code	Blue	Orange	Green	Brown	Grey	White
	7	8	9	10	11	12
	Red	Black	Yellow	Violet	Pink	Aqua

## 3.4 Color Code of the Loose Tube and Filler

The loose tubes will be identifiable in accordance with the following color sequence. The color of the fillers will be natural.

6-12 tubes	1	2	3	4	5	6
	Blue	Orange	Green	Brown	Grey	White
	7	8	9	10	11	12
	Red	Black	Yellow	Violet	Pink	Aqua
24 tubes	Inner 1	Inner 2	Inner 3	Inner 4	Inner 5	Inner 6
	Blue	Orange	Green	Brown	Grey	White
	Inner 7	Inner 8	Inner 9	Outer 1	Outer 2	Outer 3
	Red	Black	Yellow	Violet	Pink	Aqua
	Outer 4	Outer 5	Outer 6	Outer 7	Outer 8	Outer 9
	Blue with black stripe	Orange with black stripe	Green with black stripe	Brown with black stripe	Grey with black stripe	White with Black stripe
	Outer 10	Outer 11	Outer 12	Outer 13	Outer 14	Outer 15
	Red with black stripe	Black with white stripe	Yellow with black stripe	Violet with black stripe	Pink with black stripe	Aqua with black stripe

## 3.5 Dimensions and Descriptions of Cable Constructions

Item	Contents	Value	
		48	96
Loose Tube	Number	4	8
	Outer diameter ( $\pm 0.1\text{mm}$ )	1.7	1.45
Filler	Number	2	0
Fiber counts per tube	G.657A1 200um	12	
Central strength member	Material	FRP	
	Diameter (mm)	1.8	2.6
	PE layer diameter (mm)	/	
Outer sheath	Material	HDPE	
	Color	Black	
	Thickness (mm)	Approx 0.5	
Cable diameter ( $\pm 0.3\text{mm}$ )		6.1	6.3
Cable weight (kg/km) Approx.		30	36
For micro-duct inside (mm)		8 ~ 12	
Max. tensile strength (N)		650	900
Crush (N/100mm)		500	

## 4. MECHANICAL, ELECTRICAL AND ENVIRONMENTAL TEST CHARACTERISTICS

The finished cables can be subjected to the following mechanical, electrical and environmental conditions.

Item	Test Method	Requirements
Tensile performance	IEC 60794-1-21-E1 Load: according to short term tensile described in 3.2.2 Cable length under tension: Not less than 50m. Duration of load sustain: 1min. Velocity of transfer device: 10mm/min	The maximum fiber strain less than 0.33% under maximum tensile short term load. The maximum increase in attenuation less than 0.1dB. No change in attenuation after test at 1550nm. Under visual examination without magnification, no damage to the sheath or to the cable elements after test.
Crush	IEC 60794-1-21-E3 Load: 500N Duration of load: 1min	The maximum increase in attenuation less than 0.1dB after test. Under visual examination without magnification, no damage to the sheath or to the cable elements. The imprint of the striking surface on the sheath is not considered mechanical damage.
Impact	IEC 60794-1-21-E4 Radius: 300 mm Impact energy: 2J Impact number: 1 Impact points: 3	The maximum increase in attenuation less than 0.1dB after test. Under visual examination without magnification, no damage to the sheath or to the cable elements.
Bend	IEC 60794-1-21-E11A Mandrel radius: 20 times cable diameter Turns: 5 Cycles: 3	The maximum increase in attenuation less than 0.1dB after test. Under visual examination without magnification, no damage to the sheath or to the cable elements.
Repeated bending	IEC 60794-1-21-E6 Bending radius: 20 times cable diameter Cycles: 35 Load: 40N Duration of cycle: Approx. 2s.	The maximum increase in attenuation less than 0.1dB after test. Under visual examination without magnification, no damage to the sheath or to the cable elements.
Torsion	IEC 60794-1-21-E7 Cycles:5 Length under test: 1m Turns: $\pm 180^\circ$ Load: 40N	The maximum increase in attenuation less than 0.1dB after test. Under visual examination without magnification, no damage to the sheath or to the cable elements. No permanent change in attenuation after test
Temperature cycling	IEC 60794-1-22-F1 Sample length: at least 1000m Temperature range: $-40^\circ\text{C} \sim +70^\circ\text{C}$ Cycles: 2 Temperature cycling test dwell time: 12 hours	There is no change in attenuation coefficient at 1550nm after the test.
Water Penetration	IEC 60794-1-22-F5B Time : 24 hours Sample length : 3m Water height : 1m	No water leakage
Other parameters	According to IEC 60794	

Remark: "No attenuation changes" is considered as the attenuation changes  $\leq 0.05$  dB.

## 5. PACKAGING AND DRUM

### 5.1 Cable Sheath Marking

Unless otherwise specified, the cable sheath marking shall be as follows:

- ⊗ Color: white
- ⊗ Contents: Mainframe Communications, the year of manufacture, the type of cable, length marking
- ⊗ Interval: 1m

### 5.2 Reel length

Standard reel length: 4 km

### 5.3 Cable drum

The cables are packed in ply-wooden drums.

### 5.4 Cable packing

The direction of rotation of the color scheme is shown by marking the clockwise and anti-clockwise ends with red and green adhesive tape respectively.

The markings are on both sides of the flanges as follows:

- ⊗ Cable Type/Size
- ⊗ Cable Length
- ⊗ Gross Weight.
- ⊗ Mainframe Communications.
- ⊗ Shipping mark.

### 5.5 Cable packing

Both cable ends are provided with protections against water penetration and firmly secured to the drum, so the cable cannot move and the turns cannot slide when it is moved, handled or laid. the inner end is available for testing.