OPTICAL FIBER CABLE · ARMORED DUCT

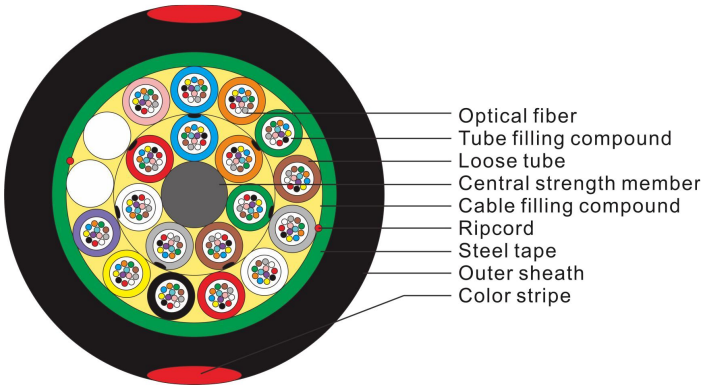
24-216C

ARMORED DUCT

MODEL **GYFTS**

Single-mode optical fiber cable for duct application, 24 to 216 fibers, stranded loose tubes around an FRP central strength member.

FIBER COUNT	FIBER TYPE
24-216	**G.652D**
TUBES	OD
2-18	**12.3-16.0 mm**



01 OVERVIEW

Scope & cable cross-section

This Specification covers the design requirements and performance standard for the supply of optical fiber cable in the industry. ZUOYEAL ensures a stable quality control system for our cable products through several programs including ISO 9001, ISO 14001 and ROHS.

The GYFTS is designed for duct installation and follows the construction below.

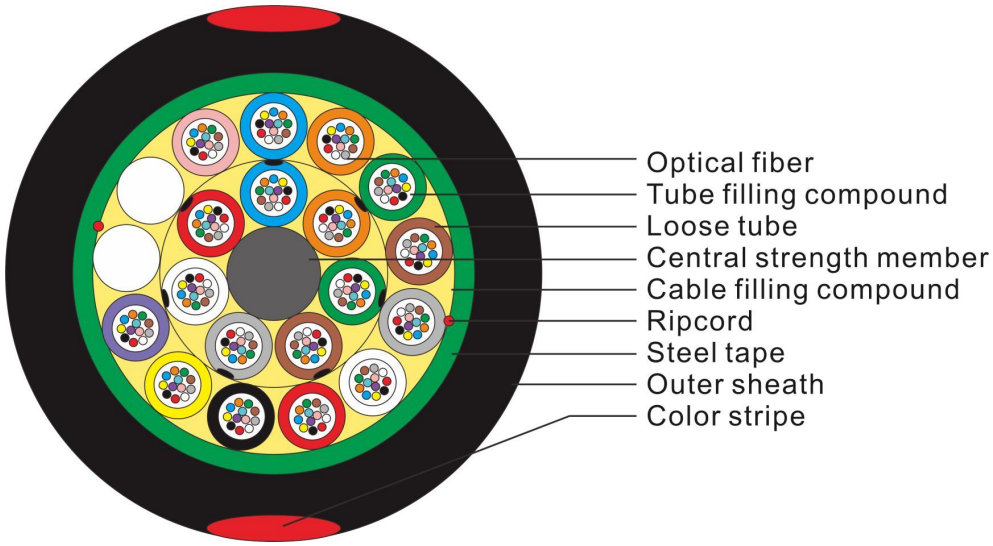


FIG. 1 Cable cross-section (not to scale)

- Optical fibers are housed in loose tubes made of high-modulus plastic, filled with waterproof compounds.
- FRP is applied as central strength member; loose tubes are SZ stranded around it.
- Water blocking tape is used over the cable core to prevent water ingress.
- Polyethylene sheath is applied as outer sheath.

AT A GLANCE

ITEM	VALUE	ITEM	VALUE
Fiber counts	24 · 48 · 72 · 144 · 216	Fiber type	G.652D
Cable diameter	12.3 - 16.0 mm	Cable weight	141 - 238 kg/km

02 STANDARDS

Reference standards

STANDARD	SCOPE
ITU-T G.652	Characteristics of a single-mode optical fibre
IEC 60794-1-1	Optical fibre cables — part 1-1: generic specification, general
IEC 60794-1-2	Optical fibre cables — part 1-2: basic optical cable test procedure
IEC 60794-3	Optical fibre cables — part 3: sectional specification, outdoor cables

03 IDENTIFICATION

Cable identification

3.1 FIBER COLOR CODE

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

3.2 LOOSE TUBE (LT) & FILLER ROD (FR) COLOR CODE

FIBRE COUNT	ELEMENT NO.												
	1	2	3	4	5	6	7	8	9	10	11	12	13
24	LT	LT	FR	FR	FR	FR							
48	LT	LT	LT	LT	FR	FR							
72	LT	LT	LT	LT	LT	LT							
144	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	
216	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	FR	LT
	LT+BS	LT+BS	LT+BS	LT+BS	LT+BS	LT+BS	LT+BS						

LT = loose tube, FR = filler rod, BS = black stripe.

04 MATERIALS

4.1 Cable materials

The filling compound shall be a homogeneous, colorless or white, transparent or translucent substance, free of odor, dust, metal particles and other impurities. It is homogenous and uniformly mixed, sufficiently translucent for fiber identification without affecting the colour of the secondary coating, and free from dirt, metallic particles and other foreign matter. It leaves no residue that makes it difficult to connect the fibers and contains no highly inflammable materials. It is non-toxic with no dermal hazards; ordinarily no special cleaning agent is required for removal from human skin. It cannot flow at any temperature encountered up to 80 °C and remains stable under long-term exposure to weather. The compound exhibits tensile rather than greasy properties, and at 23 ± 3 °C shows: dissipation factor @ 1 MHz (ASTM D150) ≤ 0.0015; dielectric constant (ASTM D150) ≤ 2.30; volume resistivity (ASTM D257) ≥ 1E12 Ω·cm. It has chemical and mechanical compatibility with other cable components and splicing hardware such that no significant degradation results.

PE SHEATH	UNIT	VALUE
Melt flow rate	g/10 min	≤ 1.5
Tensile strength	MPa	≥ 20
Elongation at break	%	≥ 650
Oxidation induction (200 °C)	min	≥ 40
Environmental stress cracking	h	≥ 500
Carbon black content	%	2.6 ± 0.25
Shore hardness D (15 s)	—	≥ 54

05 CONSTRUCTION

4.2 Cable assembly & dimensions

ITEM	CONTENT	24/48	72	144	216
Loose tube	Number	2/4	6	12	7+11
Loose tube	Outer diameter (mm)	2.3 ± 0.1	2.3 ± 0.1	2.1 ± 0.1	2.0 ± 0.1
Loose tube	Thickness (mm)	0.3 ± 0.05			
Loose tube	Material	PBT			
Loose tube	Water blocking	Tube filling compound			
Filler	Number	4/2	0	0	0+2
Filler	Material	PP			
Max. fiber counts per tube	G.652D	12			
CSM	Material	FRP			
CSM	Diameter (mm)	2.5 ± 0.1	2.5 ± 0.1	2.8 ± 0.1	2.8 ± 0.1
CSM	PE layer diameter (mm)	–	–	6.5 ± 0.1	–
Cable core	Water blocking	Cable filling compound			
Ripcord	Number	2 (180° apart)			
Armored	Material	Corrugated steel tape			
Stripe	Color	Red × 2 (Pantone 186C)			
Stripe	Width	3 mm or 15% D	3 mm or 15% D	5 mm or 15% D	5 mm or 15% D
Outer sheath	Material	HDPE (no holes, splits, blisters)			
Outer sheath	Color	Black			
Outer sheath	Thickness (mm)	Nominal 2.0, minimum 1.8			
Cable diameter (mm)	Approx. (±5%)	12.3	12.3	15.9	16.0
Cable weight (kg/km)	Approx. (±15%)	141	141	230	238

06 OPTICAL

Performance of cabled optical fiber

The performance of cabled optical fiber (ITU-T Rec. G.652D).

ITEM	CONDITION	SPECIFICATION
Fiber type		Single mode
Fiber material		Doped silica
Attenuation coefficient	1310 nm	≤ 0.36 dB/km
Attenuation coefficient	1383 nm	≤ 0.32 dB/km
Attenuation coefficient	1550 nm	≤ 0.22 dB/km
Attenuation coefficient	1625 nm	≤ 0.24 dB/km
Cable cut-off wavelength		≤ 1260 nm
Zero-dispersion wavelength		1300 - 1324 nm
Zero-dispersion slope		≤ 0.093 ps/(nm²·km)
Chromatic slope coefficient	1550 nm	≤ 0.056 ps/(nm²·km)
Chromatic dispersion	1288 - 1339 nm	≤ ±3.0 ps/(nm·km)
Chromatic dispersion	1550 nm	≤ 17 ps/(nm·km)
Chromatic dispersion	1625 nm	≤ 22 ps/(nm·km)
PMD		≤ 0.2 ps/√km
Micro bending loss	1550 nm, 100 turns Ø60 mm	≤ 0.05 dB
Micro bending loss	1625 nm, 100 turns Ø60 mm	≤ 0.05 dB
Splice loss	1310 nm / 1550 nm	≤ 0.03 dB
Mode field diameter	1310 nm	(8.6 - 9.5) ± 0.5 μm
Mode field diameter	1550 nm	10.4 ± 0.8 μm
Core / cladding concentricity error		≤ 0.6 μm
Coating / cladding concentricity error		≤ 12 μm
Cladding diameter		125.0 ± 1.0 μm
Cladding non-circularity		≤ 1.0 %
Primary coating diameter		245 ± 10 μm
Proof stress		≥ 0.69 GPa

07 PERFORMANCE

Cable performance

ITEM	SPECIFICATION
Bending radius	10 × cable diameter (static) · 20 × cable diameter (dynamic)
Operating temperature	0 °C to +80 °C
Storage / transport temperature	−25 °C to +80 °C
Installation temperature	0 °C to +80 °C

08 TESTING

Mechanical & environmental performance

TEST METHODS & ACCEPTANCE

<table>
<tr><th>S/N</th><th>ITEM</th><th>TEST METHOD</th><th>ACCEPTANCE</th></tr>
<tr><td>1</td><td>Tensile loading
EIA FOTP-33</td><td>2,000 N · 100 m · ≥ 1 min</td><td>Δ loss ≤ 0.1 dB @1550 nm
Strain ≤ 0.33 %</td></tr>
<tr><td>2</td><td>Cable cyclic flexing
EIA FOTP-104</td><td>10 × OD (no load) · 20 × OD (under load)
30 cycles/min · 30 cycles
<table>
<tr><th>OD (mm)</th><th>MIN. LOAD (N)</th><th>OD (mm)</th><th>MIN. LOAD (N)</th></tr>
<tr><td>≤ 2.5</td><td>14.71</td><td>9.1 - 13.0</td><td>49.03</td></tr>
<tr><td>2.6 - 4.0</td><td>24.52</td><td>13.1 - 18.0</td><td>53.94</td></tr>
<tr><td>4.1 - 6.0</td><td>29.23</td><td>24.1 - 30.0</td><td>73.55</td></tr>
<tr><td>6.1 - 9.0</td><td>44.13</td><td></td><td></td></tr>
</table></td><td>Δ loss ≤ 0.1 dB @1550 nm
No fibre break, no sheath damage</td></tr>
<tr><td>3</td><td>Cyclic impact
EIA FOTP-25</td><td>25 impacts · 150 mm · 5 N·m · R12.5 mm</td><td>Δ loss ≤ 0.2 dB @1550 nm
No fibre break, no sheath damage</td></tr>
<tr><td>4</td><td>Compressive loading
EIA FOTP-41</td><td>≥ 4 m · plate 100 mm · 250 N/cm</td><td>Δ loss ≤ 0.1 dB/km @1550 nm
No fibre break, no sheath damage</td></tr>
<tr><td>5</td><td>Twist
EIA FOTP-85</td><td>4 m · ±180° · 1-2 cycles/min · 10 cycles
<table>
<tr><th>OD (mm)</th><th>MIN. LOAD (N)</th><th>OD (mm)</th><th>MIN. LOAD (N)</th></tr>
<tr><td>≤ 2.5</td><td>14.71</td><td>13.1 - 18.0</td><td>53.94</td></tr>
<tr><td>2.6 - 4.0</td><td>24.52</td><td>18.1 - 24.0</td><td>63.74</td></tr>
<tr><td>4.1 - 6.0</td><td>29.23</td><td>24.1 - 30.0</td><td>68.65</td></tr>
<tr><td>6.1 - 9.0</td><td>44.13</td><td>≥ 30.1</td><td>73.55</td></tr>
<tr><td>9.1 - 13.0</td><td>49.03</td><td></td><td></td></tr>
</table></td><td>Δ loss ≤ 0.1 dB @1550 nm
No fibre break, no sheath damage</td></tr>
<tr><td>6</td><td>Water penetration
IEC 794-1-2-F5B</td><td>1 m head · 3 m · 24 h</td><td>No water at the opposite end</td></tr>
<tr><td>7</td><td>Low & high temperature bend
EIA FOTP-37</td><td>−29 / 60 °C · mandrel 10 × OD · 4 turns
<table>
<tr><th>OD (mm)</th><th>TEST MASS (kg)</th><th>OD (mm)</th><th>TEST MASS (kg)</th></tr>
<tr><td>≤ 2.0</td><td>2.5</td><td>15.1 - 17.9</td><td>20.0</td></tr>
<tr><td>2.1 - 2.5</td><td>5.0</td><td>18.0 - 20.0</td><td>22.5</td></tr>
<tr><td>2.6 - 6.4</td><td>10.0</td><td>20.1 - 22.9</td><td>25.0</td></tr>
<tr><td>6.5 - 12.7</td><td>12.5</td><td>≥ 23.0</td><td>unspecified</td></tr>
<tr><td>12.8 - 15.0</td><td>15.0</td><td></td><td></td></tr>
</table></td><td>Δ loss ≤ 0.2 dB/km @1550 nm
No fibre break, no sheath damage</td></tr>
<tr><td>8</td><td>Hydrogen
IEC 794-1</td><td>14 h</td><td>Δ loss ≤ 0.1 dB @1550 nm</td></tr>
</table>

09 PACKING

Packing & marking

7.1 CABLE SHEATH MARKING

Each length of cable shall be permanently marked to identify the manufacturer, capacity of the cable, month and year of manufacture, length markings and the phrase shown below. The legend can be changed according to the user's requests, and markings shall be printed at intervals of not more than one (1) metre.

Eg. ZUOYEAL 72C FOC OCT 2023 SM PLDT/SMART PROPERTY - FIBER OPTIC CABLE 0001M

7.2 Each single cable length is wound on an iron stand-wooden composite or pure wooden drum.

7.3 Standard drum length is 2,000 / 3,000 / 4,000 m with ±2%.

7.4 Covered by a plastic buffer sheet. 7.5 Sealed by strong wooden battens.

7.6 The ends of all cables shall be sealed to prevent the escape of filling compound and to prevent the entry of moisture during shipping, handling, storage and installation.

7.7 The outer end of the cable shall be securely fastened to the reel head so as to prevent the cable from becoming loose in transit; the inner end shall be fastened so as to be readily available for testing.

7.8 If either or both ends are ordered with connectors, both ends shall be equipped with flexible pulling eyes to protect the connector and fiber loads.

7.9 Both ends of the cable are sealed with suitable plastic caps to prevent the entry of moisture during shipping, handling and storage.

7.10 A thermal protective wrap shall be securely applied over the outer turns of the cable on each reel. The wrap shall be weather resistant and limit solar heating, and shall be labelled "DO NOT REMOVE WRAP UNTIL CABLE IS PLACED". It may be omitted when tags or other reel protection devices are provided.

DRUM DIMENSIONS

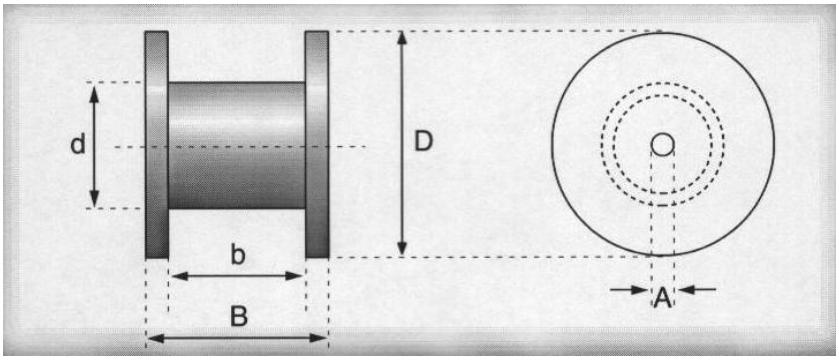


FIG. 2 Drum dimensions — D contains the seal dimension

CABLE TYPE	DRUM LENGTH (m)	D (mm)	d (mm)	B (mm)	b (mm)
GYFTS 24/48/72C	4,000	1,538	700	720	610
GYFTS 144/216C	4,000	1,538	700	1,100	1,000

The value "D" contains the seal dimension.

ORDERING INFORMATION

MODEL	GYFTS-<fibres>C — for example GYFTS-144C
FIBRE COUNT	24 · 48 · 72 · 144 · 216
DRUM LENGTH	4,000 m per drum (±2%); other lengths on request

ZUOYEAL

ZUOYEAL TECHNOLOGY

Connecting More, With Fiber

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This datasheet describes the GYFTS armored duct cable series at the time of publication. Dimensions, weights and configurations may change without notice; confirm current values with ZUOYEAL before ordering.

24–216C · G.652D · ARMORED DUCT

Connecting More, With Fiber