

# Optical Fibre Cable Technical Specification

## Duct Cable GYFZY(FR)-nB1.3

Yangtze Optical Fibre and Cable Joint Stock Limited Company

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| Customer Approval |      |           |      |
|-------------------|------|-----------|------|
|                   | Name | Signature | Date |
| Approved by       |      |           |      |

## 1. General

### 1.1 Scope

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

| Cable type      | Application       |
|-----------------|-------------------|
| GYFZY(FR)-nB1.3 | Duct installation |

n represent the fibre counts of the cable.

### 1.2 Reference

The cable offered by YOFC are designed, manufactured and tested according to the standards as follows:

|                |                                                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 60794-1-21 | Optical fibre cables- part1-2-Generic specification-Basic optical cable test procedure-Mechanical test methods                                        |
| IEC 60794-1-22 | Optical fibre cables- part1-2-Generic specification-Basic optical cable test procedure-Environmental test methods                                     |
| IEC 60794-3    | Optical fibre cables-part 3: Sectional specification-Outdoor cables                                                                                   |
| IEC 60794-3-10 | Optical fibre cables-part 3-10: Outdoor cables-Family specification for duct and direct buried optical communication cables                           |
| IEC 60794-3-11 | Optical fibre cables-Part 3-11: Outdoor cables-Detailed specification for duct and directly buried single-mode optical fibre telecommunication cables |

### 1.3 Life Time

Optical fibre cables supplied in compliance with this specifications is capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

### 1.4 Application

| Item                     | Value                       |
|--------------------------|-----------------------------|
| Operation temperature    | -40 °C~+70 °C               |
| Installation temperature | -10 °C~+70 °C               |
| Storage temperature      | -40 °C~+70 °C               |
| Static bending radius    | 15 times the cable diameter |
| Dynamic bending radius   | 25 times the cable diameter |

## 2. Optical Fibre

Optical Fibres supplied in this specification meet the requirements of ITU-T G.652

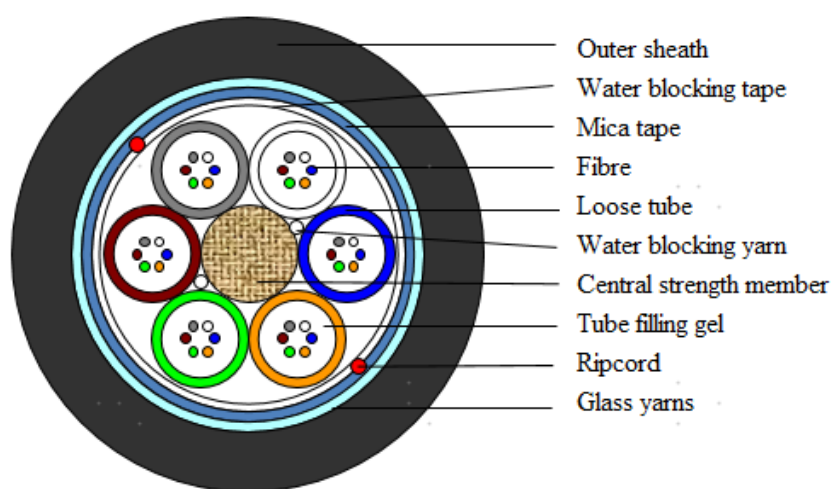
| Parameter                                                   | Specification                                                                        |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------|
| MFD (1310nm)                                                | 8.7~9.5 $\mu\text{m}$                                                                |
| Cladding diameter                                           | 125 $\pm$ 1.0 $\mu\text{m}$                                                          |
| Fibre diameter                                              | 235~255 $\mu\text{m}$ , with UV coating, and colored to : 250 $\pm$ 15 $\mu\text{m}$ |
| Core/cladding concentricity error                           | $\leq 0.6\mu\text{m}$                                                                |
| Coating/cladding concentricity error                        | $\leq 12.0\mu\text{m}$                                                               |
| Cladding non circularity                                    | $\leq 1.0\%$                                                                         |
| Cut off wavelength                                          | $\lambda_{cc} \leq 1260\text{nm}$                                                    |
| Attenuation coefficient                                     | 1310nm: 0.36dB/km max after cabling<br>1550nm: 0.22dB/km max after cabling           |
| Bending-loss performance of optical fibre<br>@1310nm&1550nm | $\leq 0.05\text{dB}$ (100 turns around a mandrel of 50mm diameter)                   |
| Polarization mode dispersion maximum<br>individual fibre    | $\leq 0.2\text{ps}/\sqrt{\text{km}}$                                                 |
| Polarization mode dispersion link value                     | $\leq 0.1\text{ps}/\sqrt{\text{km}}$                                                 |
| Zero-dispersion wavelength                                  | 1300~1324nm                                                                          |
| Zero-dispersion slope                                       | $\leq 0.092\text{ps}/\text{nm}^2 \cdot \text{km}$                                    |

### 3. Optical Cable

#### 3.1 Technical Characteristics

- The unique second coating and stranding technology provide the fibres with enough space and bending endurance, which ensure good optical property of the fibres in the cable
- Accurate process control ensures good mechanical and temperature performance
- High quality raw material guarantees the long service life of cable

#### 3.2 Cross Section of Cable



**GYFZY(FR)-24B1.3**

Schematic for reference only

#### 3.3 Fibre and Loose Tube Identification

The color code of fibres and loose tube will be identification in accordance with the following color sequence, other sequence also is available.

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

The color of the fillers will be black.

#### 3.4 Dimensions and Descriptions

The standard optical cable structure is shown in the following table, other structure and fibre count are also available according to customer requirements.

| Item                        | Contents                  | Value                        |       |      |
|-----------------------------|---------------------------|------------------------------|-------|------|
|                             |                           | 6~24                         | 48~72 | 96   |
| Structure                   | Type                      | 1+6                          |       | 1+6  |
| Loose tube                  | Max. fibre counts/tube    | 6                            | 12    |      |
|                             | Outer diameter (mm)       | 1.9                          | 2.1   |      |
|                             | Material                  | PBT                          |       |      |
| Central strength member     | Material                  | FRP                          |       |      |
|                             | Diameter                  | 2.0                          | 2.25  | 2.6  |
|                             | Diameter of coating layer | -                            | -     | 3.7  |
| Water blocking              | Material                  | Water Blocking Yarn and Tape |       |      |
| Fire resistance             | Material                  | Mica tape                    |       |      |
| Peripheral strength member  | Material                  | Glass yarns                  |       |      |
| Ripcord                     | Number                    | 2                            |       |      |
|                             | Color                     | Red                          |       |      |
| Sheath                      | Material                  | LSZH                         |       |      |
|                             | Color                     | Black                        |       |      |
|                             | Thickness (mm)            | Nominal: 2.2                 |       |      |
| Cable diameter(mm) Approx.  |                           | 12.5                         | 13.2  | 14.6 |
| Cable weight(kg/km) Approx. |                           | 140                          | 179   | 195  |

### 3.5 Main Mechanical Performance

| Item | Tension(N) |           | Crush(N/100mm) |           |
|------|------------|-----------|----------------|-----------|
|      | Short term | Long term | Short term     | Long term |
| 6~96 | 1500       | 600       | 1000           | 300       |

#### Main Flame Retardant and Fire Resistance

| Test          | Standard                  |
|---------------|---------------------------|
| IEC 60332-1-2 | Single vertical wire test |
| IEC 60754-1   | No halogens               |
| IEC 60754-2   | No acid matters           |
| IEC 60331-25  | 750℃, 90min, no cooling   |

## 4. Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performance of the cable are in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

| Items                      | Test Method                                                                                                                                                                                     | Requirements                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Tension</b>             | <u><b>IEC 60794-1-21-E1</b></u><br>Load: According to 3.3<br>Sample length: Not less than 50m.<br>Duration time: 1 min.                                                                         | Additional attenuation: $\leq 0.1\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Crush</b>               | <u><b>IEC 60794-1-21-E3</b></u><br>Load: According to 3.3<br>Duration of load: 1min                                                                                                             | Additional attenuation: $\leq 0.1\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Impact</b>              | <u><b>IEC 60794-1-21-E4</b></u><br>Radius: 300 mm<br>Impact energy: 5 J<br>Impact number: 1<br>Impact points: 3                                                                                 | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements            |
| <b>Repeated bending</b>    | <u><b>IEC 60794-1-21-E6</b></u><br>Bending radius: $25 \times D$<br>Cycles: 10<br>Load: 150N                                                                                                    | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements            |
| <b>Torsion</b>             | <u><b>IEC 60794-1-21-E7</b></u><br>Cycles: 10<br>Length under test: 1m<br>Turns: $\pm 180^\circ$<br>Load: 150N                                                                                  | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements            |
| <b>Water Penetration</b>   | <u><b>IEC 60794-1-22-F5B</b></u><br>Time : 24 hours<br>Sample length : 3m<br>Water height : 1m                                                                                                  | No water leakage after 24 hours.                                                                       |
| <b>Temperature cycling</b> | <u><b>IEC 60794-1-22-F1</b></u><br>Sample length: at least 1000m<br>Temperature range: $-40^\circ\text{C} \sim +70^\circ\text{C}$<br>Cycles: 2<br>Temperature cycling test dwell time: 12 hours | The change in attenuation coefficient shall be less than $0.1 \text{ dB/km}$ at 1550nm.                |
| <b>Other parameters</b>    | According to <u><b>IEC 60794-1</b></u>                                                                                                                                                          |                                                                                                        |

## **5. Packaging and Drum**

### **5.1 Cable Sheath Marking**

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

Color: white

Contents: YOFC, the year of manufacture, the type of cable, cable number, length marking

Interval: 1 m

Outer sheath marking legend can be changed according to user's requests.

### **5.2 Reel Length**

Standard reel length: 2/3 km/reel, other length is also available.

### **5.3 Cable Drum**

The cables are packed in fumigated wooden drums.

### **5.4 Cable Packing**

Both ends of the cable will be sealed with suitable plastic caps to prevent the entry of moisture during shipping, handling and storage. The inner end is available for testing.