

# Optical Fibre Cable Technical Specification

## Universal Cable

### G24

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## 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     |
|---------------|-----------------|
| GJFXHP-24B6a1 | Universal cable |

### 1.2 Reference

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

|                |  |
|----------------|--|
| ITU-T G.657    | Characteristics of a bending-loss insensitive single-mode optical fibre and cable for the access network           |
| IEC 60794-1-1  | Optical fibre cables-part 1-1: Generic specification-General   |
| IEC 60794-1-21 | Optical fiber cables- part1-21-Generic specification-Basic optical cable test procedure-Mechanical test methods    |
| IEC 60794-1-22 | Optical fiber cables- part1-22-Generic specification-Basic optical cable test procedure-Environmental test methods |
| IEC 60794-2    | Optical fibre cables – Part 2: Indoor cables – Sectional specification   |
| IEC 60794-2-20 | Optical fibre cables - Part 2-20 Indoor cables - Family specification for multi-fibre optical 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 25 years without detriment to the operation characteristics of the cable.

### 1.4 Application

| Item                         | Value                  |
|------------------------------|------------------------|
| Installation temperature     | -10°C ~ +50°C          |
| Operation temperature        | -30°C ~ +70°C          |
| Storage temperature          | -40°C ~ +70°C          |
| Bending radius(Installation) | 20D(D: Cable diameter) |
| Bending radius(Operation)    | 10D(D: Cable diameter) |

## 2. Optical Fibre

Optical properties of the SM fiber are achieved through a germanium doped silica based core with a pure silica cladding which meets ITU-T G657A1, 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:

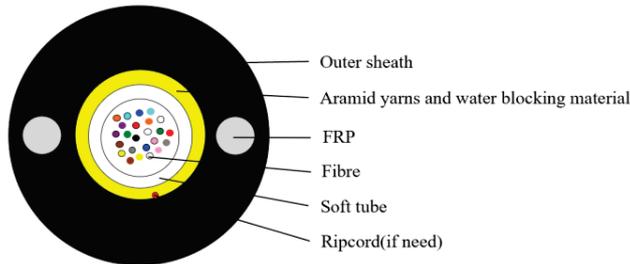
| Category                    | Description                                | Specification   |
|-----------------------------|--|---|
| Geometric characteristic    | Cladding diameter                          | $125.0 \pm 0.7\mu\text{m}$  |
|                             | Cladding non-circularity                   | $\leq 0.7\%$  |
|                             | Core-cladding concentricity error          | $\leq 0.5\mu\text{m}$   |
|                             | Coating diameter (uncolored)               | $245 \pm 10\mu\text{m}$   |
|                             | Coating diameter (colored)                 | $250 \pm 15\mu\text{m}$   |
|                             | Coating-cladding concentricity error       | $\leq 12\mu\text{m}$  |
| Transmission characteristic | Attenuation coefficient at 1310 nm         | $\leq 0.38\text{dB/km}$   |
|                             | Attenuation coefficient at 1550 nm         | $\leq 0.25\text{dB/km}$   |
|                             | Attenuation coefficient at 1625 nm         | $\leq 0.30\text{dB/km}$   |
|                             | Mode field diameter at 1310nm              | $8.4\sim 9.2\mu\text{m}$  |
|                             | Cable cutoff wavelength ( $\lambda_{cc}$ ) | $\leq 1260\text{ nm}$   |
|                             | Zero Dispersion Wavelength ( $\lambda_0$ ) | $1300 \leq \lambda_0 \leq 1324\text{ nm}$                                       |
|                             | Zero Dispersion Slope (S0)                 | $\leq 0.092\text{ ps}/(\text{nm}^2.\text{km})$                                  |
|                             | Dispersion coefficient at (1285nm-1330nm)  | $\leq 3.5\text{ps}/(\text{nm}.\text{km})$                                       |
|                             | Dispersion coefficient at 1550 nm          | $\leq 18\text{ps}/(\text{nm}.\text{km})$  |
|                             | Macro-bend loss (10 turns, 15mm,radius)    | $\leq 0.25\text{ dB at }1550\text{nm}$<br>$\leq 1.0\text{ dB at }1625\text{nm}$ |
|                             | Macro-bend loss (1 turn, 10mm radius)      | $\leq 0.75\text{ dB at }1550\text{nm}$<br>$\leq 1.5\text{ dB at }1625\text{nm}$ |
| Mechanical characteristic   | Proof stress level                         | $\geq 100\text{kpsi (0.69Gpa)}$   |
|                             | Fibre curl radius                          | $\geq 4\text{ m}$   |
| Other Characteristics       | Conform to IEC 60793-2-50                  |   |

### 3. Optical Cable

#### 3.1 Technical Characteristics

- Several optical fibres are housed in a soft tube.
- Aramid yarns are used in the cable core as the strength member.
- LSZH with two FRPs is applied over the cable core as outer sheath.

#### 3.2 Cross Section of Cable



GJFXHP-24B6a1

(Schematic for reference only)

#### 3.3 Fibre Identification

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

|                  |       |     |        |       |      |      |       |         |        |           |        |      |
|------------------|-------|-----|--------|-------|------|------|-------|---------|--------|-----------|--------|------|
| Fibre color code | 1     | 2   | 3      | 4     | 5    | 6    | 7     | 8       | 9      | 10        | 11     | 12   |
|                  | White | Red | Yellow | Green | Blue | Grey | Brown | Black   | Violet | Turquoise | Orange | Pink |
|                  | 13    | 14  | 15     | 16    | 17   | 18   | 19    | 20      | 21     | 22        | 23     | 24   |
|                  | White | Red | Yellow | Green | Blue | Grey | Brown | Natural | Violet | Turquoise | Orange | Pink |

#### 3.4 Cable structure and relevant properties

##### 3.4.1 Dimensions and Descriptions of Cable Constructions

| Item                        | Contents                     | Value                            |
|-----------------------------|------------------------------|----------------------------------|
| Soft tube                   | Fiber count                  | 24                               |
|                             | Color                        | White                            |
|                             | Material                     | LSZH                             |
|                             | Stripability optical element | ≥1000mm, down to primary coating |
| Strength member             | Assemble                     | Aramid yarn & Two FRPs           |
| Outer sheath                | Material                     | LSZH with UV resistance          |
|                             | Color                        | Black                            |
|                             | Thickness(mm)                | Nom. 1.7                         |
| Cable diameter(±0.2mm)      |                              | 6.0                              |
| Cable weight(kg/km) Approx. |                              | 43                               |

**Expected service life, provided the installation is carried out in accordance with the manufacturer’s specifications and applicable standards: 30 years**

### 3.4.2 Mechanical Performance of Cable

| Tensile performance(N) |                 | Crush(N/100mm) |                 |
|------------------------|-----------------|----------------|-----------------|
| Long term load         | Short term load | Long term load | Short term load |
| 300                    | 1000            | 300            | 500             |

## 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.

| No. | Items               | Test Method   | Requirements  |
|-----|---------------------|---|---|
| 4.1 | Tensile performance | IEC 60794-1-21-E1<br>Load: 1000N<br>Cable length under tension: $\geq 50\text{m}$ .<br>Duration of load sustain: 10 min.  | Fibre strain $\leq 0.6\%$<br>$\Delta\alpha \leq 0.05\text{dB}$ .<br>No damage to outer jacket.  |
| 4.2 | Crush               | IEC 60794-1-21-E3<br>Load: 300N for 10min and 500N for 1min   | $\Delta\alpha \leq 0.10\text{dB}$ under long term load and $\Delta\alpha$ reversible after short term load.<br>No damage to outer jacket.   |
| 4.3 | Impact              | IEC 60794-1-21-E4<br>Hammer radius: 12.5mm<br>Number of impacts: One in 3 different places spaced not less than 500 mm apart.<br>Impact energy: 1J.   | $\Delta\alpha \leq 0.05\text{dB}$ after test.<br>No damage to outer jacket.   |
| 4.4 | Repeated bending    | IEC 60794-1-21-E6<br>Bending radius: $20 \times D$<br>Cycles: 30 Load: 20N  | $\Delta\alpha \leq 0.05\text{dB}$ after test.<br>No damage to outer jacket.   |
| 4.5 | Torsion             | IEC 60794-1-21-E7<br>Test length=1m Load=20N<br>Turns= $\pm 180^\circ$ Number of cycles: 10   | $\Delta\alpha \leq 0.05\text{dB}$ after test.<br>No damage to outer jacket.   |
| 4.6 | Bend                | IEC 60794-1-21-E11A<br>Radius $r=10D$ (D: cable diameter)<br>Turns: 4 Cycles: 3   | $\Delta\alpha \leq 0.05\text{dB}$ after test.<br>No damage to outer jacket.   |
| 4.7 | Temperature cycling | IEC 60794-1-22-F1<br>Temperature range:<br>$T_{A1}: -30^\circ\text{C}$ , $T_{A2}: -40^\circ\text{C}$<br>$T_{B1}: +70^\circ\text{C}$ , $T_{B2}: +70^\circ\text{C}$<br>Cycles: 2 Dwell time: 8h | During test:<br>$\Delta\alpha \leq 0.05 \text{ dB/km}$ for $T_{A1}$ and $T_{B1}$<br>$\Delta\alpha \leq 0.15 \text{ dB/km}$ for $T_{A2}$ and $T_{B2}$<br>After test: $\Delta\alpha$ reversible |
| 4.8 | Water penetration   | IEC 60794-1-22-F5B<br>Time: 24 hours<br>Sample length: 3m<br>Water height: 1m   | No water leakage.(Not including the soft tube)  |
| 4.9 | CPR                 | Dca-s1 d2 a1  |   |

## **5. Packaging and Drum**

### **5.1 Cable Sheath Marking**

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

Color: White

Interval: 1m

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

### **5.2 Reel Length**

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

### **5.3 Cable Drum**

The cables are packed in 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.