# Intermittently Bonded Ribbon Fiber(250um)/Gel-Free/Single Jacket/Non-Armored

## 1. SCOPE

This specification covers the general requirements of the intermittently bonded ribbon fiber optic cable for outdoor applications.

## 2. OPTICAL FIBER

The optical, geometrical and mechanical performance of the optical fiber shall be in accordance with Table 1 below.

Table 1. Performance of the single mode fiber (ITU-T G.657A2)

| ITEMS | | UNITS | SPECIFICATION |
|---|---|---|---|
| Attenuation at 1310/1383/1550nm | | dB/km | ≤ 0.40 / ≤ 0.40 / ≤ 0.30 |
| CD at 1285~1330/1550 nm | | ps/nm.km | ≤ 3.5 / ≤ 18 |
| Zero Dispersion Wavelength | | nm | 1300 ~ 1324 |
| Zero Dispersion Slope | | $ps/nm^2.km$ | ≤ 0.092 |
| Cable PMD ($PMD_Q$) | | ps/√km | ≤ 0.2 (20 section link) |
| Cut-off wavelength (λcc) | | nm | ≤ 1260 |
| Bending loss at 1550/1625nm | R15mm x 10 | dB | ≤ 0.03 / ≤ 0.1 |
| | R10mm x 1 | dB | ≤ 0.1 / ≤ 0.2 |
| | R7.5mm x 1 | dB | ≤ 0.5 / ≤ 1.0 |
| MFD at 1310nm | | μm | 8.6 ± 0.4 |
| Core/Cladding Concentricity Error | | μm | ≤ 0.5 |
| Cladding Diameter | | μm | 125 ± 0.7 |
| Cladding Non-circularity | | % | ≤ 1.0 |
| Coating Diameter | | μm | 245 ± 10 |
| Proof Test | | GPa | ≥ 0.69 |

## 3. IDENTIFICATION

### 3.1 Fiber and Buffer Tube Color Coding

The color code of the individual unit shall be in accordance with Table 2 below.

Table 2. Color Code of the Individual Fibers and Buffer Tubes

| No. | Color | No. | Color |
|---|---|---|---|
| 1 | Blue | 7 | Red |
| 2 | Orange | 8 | Black |
| 3 | Green | 9 | Yellow |
| 4 | Brown | 10 | Violet |
| 5 | Slate | 11 | Rose |
| 6 | White | 12 | Aqua |

### 3.2 Ribbon Identification

Ribbons within a tube shall be printed with black marking at intervals of Maximum 300 mm in accordance with Table 3 below.

Table 3. Ribbon Identification

| No. | Marking | No. | Marking | No. | Marking | No. | Marking |
|---|---|---|---|---|---|---|---|
| 1 |  | 7 |  | 13 |  | 19 |  |
| 2 |  | 8 |  | 14 |  | 20 |  |
| 3 |  | 9 |  | 15 |  | 21 |  |
| 4 |  | 10 |  | 16 |  | 22 |  |
| 5 |  | 11 |  | 17 |  | 23 |  |
| 6 |  | 12 |  | 18 |  | 24 |  |

## 4. CABLE CONSTRUCTION

Table 4. Construction of Cable

| ITEMS | | DESCRIPTION | | | |
|---|---|---|---|---|---|
| Fiber counts | | 12 ~ 48 | 60 ~ 96 | 144 | 288 |
| No. of Fibers per Ribbon | | 12 | 12 | 12 | 12 |
| No. of Ribbons per Tube | | 1 ~ 4 | 5 ~ 8 | 12 | 24 |
| Buffer Tube | Material | Thermoplastic compound (Natural color) | | | |
| | Water Blocking Material | Water Blocking Yarns or/and Tape | | | |
| Core Wrapping Tape | | Water Blocking Tape | | | |
| Rip Cord | | Two Ripcords | | | |
| Embedded Strength Member | Material | FRP (Fiberglass reinforced plastic) rods | | | |
| | No. of rods | 4 (2x2) | | | |
| Outer Jacket | | Black PE | | | |

## 5. PHYSICAL / MECHANICAL / ENVIRONMENTAL PERFORMANCE

### 5.1 Temperature Range

The cable shall be designed for the following operational, installation and storage / shipping temperature ranges.

- Operation: -40°C to +70°C
- Installation: -30°C to +60°C
- Storage/Shipping: -40°C to +70°C

### 5.2 Mechanical Requirements of the Ribbon

The mechanical requirements of the optical fiber ribbon shall be in accordance with Table 5 below.

Table 5. Mechanical Requirements of the Ribbon

| ITEMS | TEST METHOD AND ACCEPTANCE CRITERIA |
|---|---|
| Ribbon Robustness | ▪ Test method: GR-20-CORE 5.3.5<br>- Aging: 85 ± 2°C (30 days)<br>▪ Test method for twist test: TIA/EIA-455-141<br>▪ Acceptance Criteria<br>- Unaged and aged ribbon shall not show any separation of individual fibers from the ribbon structure after completion of twist test. |
| Ribbon Separation | ▪ Test method: GR-20-CORE 5.3.1<br>▪ Acceptance Criteria<br>- For unaged ribbon, a minimum of a 0.3m length of an individual fiber shall be separable from the ribbon without breaking fibers or damaging.<br>- Any single fiber shall be separable by a tool or by hand from the ribbon more than 1 m |
| Ribbon Strippability | ▪ Test method: GR-20-CORE 5.3.3<br>- Ribbon preconditioning: 85 ± 2°C (30 days)<br>- Ribbon shall be tested within 8 hours after aging<br>- No. of Strip: at least 10 times<br>▪ Acceptance Criteria<br>- At least 25mm of the matrix resin and fiber coatings shall be removed from the aged and unaged ribbon. |

## 5.3 Mechanical and Environmental Performance of the Cable

The mechanical performance of the cable shall be in accordance with Table 6 below. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1550nm.

Table 6. The Mechanical and Environmental Performance of the Cable

<table>
<tr><th>ITEMS</th><th>TEST METHOD AND ACCEPTANCE CRITERIA</th></tr>
<tr><td>Tensile Loading<br>And Bending Test</td><td>▪ Test method: TIA/EIA-455-33B<br>- Mandrel diameter: Max.40D (D = cable diameter)<br>- Installation tensile load: 2,700N for 1 hour<br>- Residual tensile load: 810N for 10 mins<br>▪ Acceptance Criteria<br>- Fiber strain:<br>≤ 60% of the fiber proof strain for installation tensile load<br>≤ 20% of the fiber proof strain for residual tensile load<br>- Attenuation increment: ≤ 0.10 dB for residual tensile load</td></tr>
<tr><td>Compressive Loading<br>Resistance Test</td><td>▪ Test method: TIA/EIA-455-41A<br>- Load:<table><tr><td>Short term<br>(For 1min)</td><td>Long term<br>(For 10min)</td></tr><tr><td>220N/cm</td><td>110N/cm</td></tr></table>- No. of point: 1 point<br>▪ Acceptance Criteria<br>- Attenuation Increment:<br>≤ Reversible after the short term load<br>≤ 0.10 dB during the long term load<br>- No jacket cracking and fibre breakage</td></tr>
<tr><td>Impact Test</td><td>▪ Test method: TIA/EIA-455-25D<br>- Impact Energy: 4.4N.m (3kg x 150mm)<br>- 2 impacts at each 3 locations along the cable length<br>▪ Acceptance Criteria<br>- Attenuation Increment: ≤ 0.10 dB after the test<br>- No jacket cracking and fiber breakage</td></tr>
<tr><td>Cyclic Flexing Test</td><td>▪ Test method: TIA/EIA-455-104A<br>- Mandrel diameter: 20D (D = cable diameter)<br>- No. of flexing cycles: 25 cycles<br>- Flexing speed: 30 cycles/minute<br>▪ Acceptance Criteria<br>- Attenuation Increment: ≤ 0.10 dB after the test<br>- No jacket cracking and fiber breakage</td></tr>
<tr><td>Cable Twist Test</td><td>▪ Test method: TIA/EIA-455-85A<br>- Cable length twisted: 2m<br>- No. of twist cycles: 10 cycles<br>- Twist angle: ±180°<br>▪ Acceptance Criteria<br>- Attenuation Increment: ≤ 0.10 dB after the test<br>- No jacket cracking and fiber breakage</td></tr>
</table>

| ITEMS | TEST METHOD AND ACCEPTANCE CRITERIA |
|---|---|
| Temperature Cycling Test | ▪ Test method: TIA/EIA-455-3B<br>- Temperature cycling schedule<br>: 23°C → -40°C → 70°C → -40°C → 70°C<br>- Soak time at each temperature: 24hours<br>▪ Acceptance Criteria<br>- Attenuation increment: ≤ 0.15 dB/km |
| Water Penetration Test | ▪ Test method: TIA/EIA-455-82C<br>- Using orifice or Presoaking is available<br>- Length of specimen: 3m<br>- Height of pressure head: 1m<br>- Test time: 24 hours<br>▪ Acceptance Criteria<br>- No leakage through the open cable end |

## 6. PACKING AND MARKING

### 6.1 Cable Marking

The jacket shall be marked with white characters at intervals of two feet (or one meter) with following information. Other marking is also available if requested by customer.

1) Purchaser name
2) Cable Type
3) Fiber type and counts
4) Name of the manufacturer
5) Year of manufacture
6) Length marking

Example)
00000FT PURCHASER OPTICAL FIBER CABLE SJNA 144F G657A2 GAON 2024 00002FT...

### 6.2 Cable Re-marking

The re-marking shall be marked, preferably with yellow characters, on a different position of the outer cable jacket, and shall have a numbering scheme differing by a minimum of 1000 from the original number. Any cable that contains two sets of cable markings shall be marked to indicate the color of the marking to be used.

### 6.3 Cable Packing

6.3.1 Standard length of cable shall be 2,000M. Other cable length is also available if required by customer.

6.3.2 Each length of the cable shall be wound on a separate wooden reel.

6.3.3 Both ends of the cable shall be sealed with a suitable plastic cap to prevent the entry of moisture during shipping, handling and storage.

6.3.4 The cable ends shall be securely fastened to the reel to prevent the cable form becoming loose in transit or during placing operations.

6.3.5 Circumference battens or Wood-fiber board shall be secured with bands to protect the cable during normal handling and shipping.

### 6.4 Cable Reel

6.4.1 Details given below shall be distinctly marked with a weatherproof material on the both outer sides of the reel flange. Other shipping mark is also available if requested by customer.

1) Purchaser's name
2) Cable type and fiber counts
3) Length of cable in meter or feet
4) Gross weight in kilogram or pound
5) Reel number
6) Name of the manufacturer
7) Year of manufacture
8) Arrow showing the direction the drum shall be rolled

6.4.2 The cable shall be shipped on reels designed to prevent damage to the cable during shipment and installation.

6.4.3 The arbor holes provided in the reels shall be nominal 75 mm or 110 mm in diameter.

## 7. HEALTH, SAFETY AND ENVIRONMENT

### 7.1 RoHS Directive

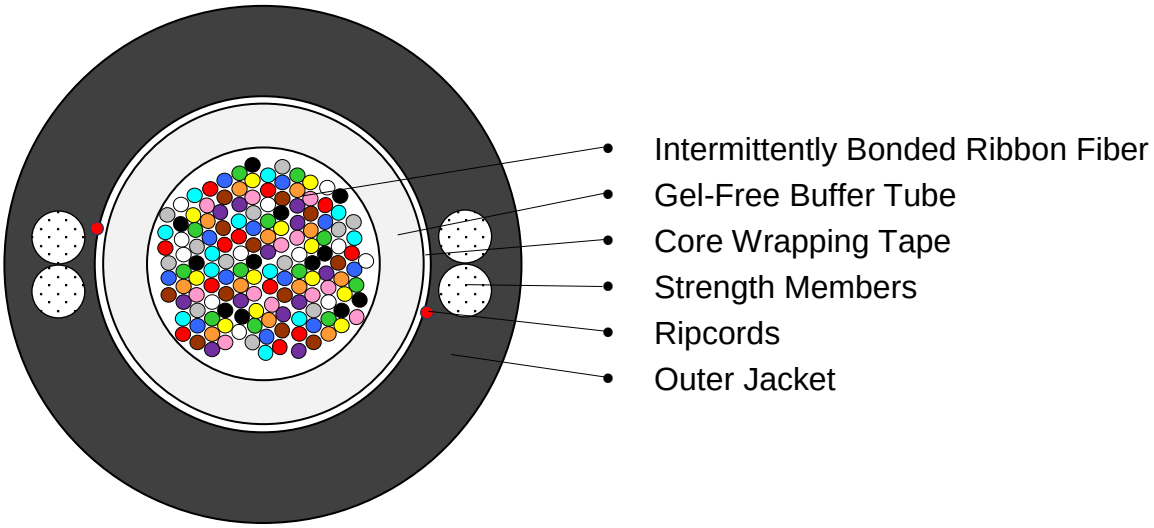
All cables and any associated packing and labeling materials shall meet RoHS (Restriction of the Use of certain Hazardous Substances) regulations as appropriate.

### 7.2 ISPM 15

All wooden packing materials shall meet ISPM (International Standards for Phytosanitary Measures) regulations as appropriate.

## 8. CROSS-SECTIONAL DRAWING OF CABLE

Ex) 144F cable




- Not to Scale -

Table 7. Cable Diameter, Weight and Minimum Bending Radius

| No. of Fibers | Cable Diameter (±0.5mm) | Approx. Cable Weight (kg/km) | Min. Bending Radius (mm) | |
|---|---|---|---|---|
| | | | No Load | Under Load |
| 12 ~ 48 | 10.3 | 90 | 160 | 210 |
| 60 ~ 96 | 11.3 | 104 | 170 | 225 |
| 144 | 12.0 | 115 | 180 | 240 |
| 288 | 14.6 | 155 | 220 | 295 |

## 9. HISTORY RECORD

| No. | Date | Descriptions |
|---|---|---|
| 00 | Jan. 25, 2024 | Issued |
| 01 | Feb. 07, 2024 | Fiber counts added. Cable construction modified. |
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