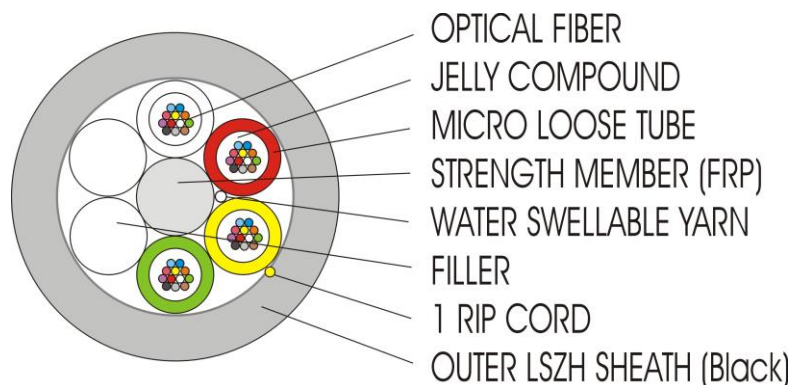


## ■ FLAME RETARDANT MINI CABLE (24C, 48C, 96C)



- SINGLE MODE OPTICAL FIBER (ITU-T G.652D, G.657A1)
- LOOSE TUBE (JELLY FILLED)
- CENTRAL STRENGTH MEMBER (FRP)
- DRY CORE DESIGN, SZ STRANDING
- MINI\_LSZH\* SHEATH FOR FLAME RETARDANT APPLICATION (Halogen free PE)

| Total Fiber Counts               |              | 24C, 48C                                                                                        | 96C  |
|----------------------------------|--------------|-------------------------------------------------------------------------------------------------|------|
| Nom. cable diameter (mm)         |              | 6.0                                                                                             | 6.9  |
| Fibers per tube                  |              | 12                                                                                              | 12   |
| Nom. loose tube diameter (mm)    |              | 1.45                                                                                            | 1.45 |
| Nom. outer sheath thickness (mm) |              | 0.8                                                                                             | 0.8  |
| Min. bend radius (mm)            | No load      | 60                                                                                              | 70   |
|                                  | Under load   | 120                                                                                             | 140  |
| Max. pulling tension (N)         | Installation | 650                                                                                             | 1200 |
|                                  | Operation    | 350                                                                                             | 650  |
| Cable weight (kg/km)             |              | 33                                                                                              | 48   |
| Recommended temperature range    |              | -40℃ ~ +70℃ (Transportation & Storage)<br>-10℃ ~ +50℃ (Installation)<br>-30℃ ~ +70℃ (Operation) |      |

Note) MINI\_LSZH\* : Mini Type \_ Flame Retardant LSZH (Low Smoke Zero Halogen) Sheath

### Flame Retardant, Mini Type \_ Optical Fiber Cable (MINI\_LSZH Sheath)

- ITU-T G.652D, LWPF (Low Water Peak Fiber), [ 24C, 48C, 96C ]
- ITU-T G.657A1 LBRF (Low Bending Radius Fiber), [ 24C, 48C, 96C ]

### ● Mechanical and Environmental Properties

| Item                | Test Method    | Test Condition                                                         | Acceptance Criteria |
|---------------------|----------------|------------------------------------------------------------------------|---------------------|
| Tensile strength    | IEC 60794-1-E1 | - Load: See table                                                      | Note 1), 2)         |
| Crush               | IEC 60794-1-E3 | - Load: 700 N/100mm                                                    | Note 1), 2)         |
| Impact              | IEC 60794-1-E4 | - Impact energy : 1J (1Nm)<br>- Impact diameter: 10mm, 3impacts        | Note 1), 2)         |
| Repeated bending    | IEC 60794-1-E6 | - Bending radius: 20×cable diameter<br>- Bending cycles: 35            | Note 1), 2)         |
| Torsion             | IEC 60794-1-E7 | - Test length: 2m<br>- Twist angle: ±180 degrees<br>- Twist cycles: 10 | Note 1), 2)         |
| Temperature cycling | IEC 60794-1-F1 | - Temperature change: -30°C→+70°C                                      | Note 3)             |
| Water penetration   | IEC 60794-1-F5 | - Cable length: 3m, Water height: 1m<br>- Duration time: 24 hrs        | No water leak       |

Note 1) Attenuation : ≤ 0.1dB

2) No mechanical damage

3) Attenuation : ≤ 0.2dB/km (each procedure), ≤ 0.1dB/km (after test)

### Annex 1. Color Code of Optical Fiber and Loose Tube

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

### Annex 2. Optical Fiber Cable Unit Composition

| Cable Core | Count of optical fiber per loose tube and unit composition (U : Unit, Tube) |    |    |    |    |    |    |    |
|------------|-----------------------------------------------------------------------------|----|----|----|----|----|----|----|
|            | U1                                                                          | U2 | U3 | U4 | U5 | U6 | U7 | U8 |
| 24C        | 12                                                                          | 12 | F  | F  | F  | F  |    |    |
| 48C        | 12                                                                          | 12 | 12 | 12 | F  | F  |    |    |
| 96C        | 12                                                                          | 12 | 12 | 12 | 12 | 12 | 12 | 12 |

Note) F: Filler (Natural color)

### Flame Retardant, Mini Type\_ Optical Fiber Cable (MINI\_LSZH Sheath)

● ITU-T G.652D, LWPF (Low Water Peak Fiber), [ 24C, 48C, 96C ]

● ITU-T G.657A1 LBRF (Low Bending Radius Fiber), [ 24C, 48C, 96C ]

### Annex 3. Optical Properties of Cable

#### ● Optical Properties of ITU-T G.652D (LWPF: Low Water Peak Fiber)

| Items of Properties                               |                                                                                                                         | Value                                                                                                                                                                        |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Geometrical Characteristics                       | Effective group index (step index)<br>@1310nm                                                                           | 1.467                                                                                                                                                                        |
|                                                   | @1550nm & 1625nm                                                                                                        | 1.468                                                                                                                                                                        |
|                                                   | Mode field diameter @1310nm                                                                                             | $9.2 \pm 0.4 \mu\text{m}$                                                                                                                                                    |
|                                                   | Core/Clad concentricity error                                                                                           | $\leq 0.5 \mu\text{m}$                                                                                                                                                       |
|                                                   | Cladding diameter                                                                                                       | $125 \pm 0.7 \mu\text{m}$                                                                                                                                                    |
|                                                   | Cladding non-circularity                                                                                                | $\leq 1.0 \%$                                                                                                                                                                |
| Optical Characteristics                           | Coating diameter (Uncolored)                                                                                            | $245 \pm 5 \mu\text{m}$                                                                                                                                                      |
|                                                   | Cutoff wavelength ( $\lambda_{cc}$ )                                                                                    | $\leq 1260\text{nm}$                                                                                                                                                         |
|                                                   | Attenuation coefficient<br>@1310nm Maximum (Typical)<br>@1383nm Maximum<br>@1550nm Maximum (Typical)<br>@1625nm Maximum | $\leq 0.35 \text{ dB/km}$ ( $\leq 0.34 \text{ dB/km}$ )<br>$\leq 0.31 \text{ dB/km}$<br>$\leq 0.22 \text{ dB/km}$ ( $\leq 0.20 \text{ dB/km}$ )<br>$\leq 0.24 \text{ dB/km}$ |
|                                                   | Bending loss @1625nm<br>30mm mandrel radius, 100 turns                                                                  | $\leq 0.05 \text{ dB}$                                                                                                                                                       |
|                                                   | Attenuation uniformity                                                                                                  | $\leq 0.05 \text{ dB}$                                                                                                                                                       |
|                                                   | Chromatic dispersion coefficient<br>@1285~1330nm<br>@1290~1330nm<br>@1550nm                                             | $\leq 3.2 \text{ ps/nm.km}$<br>$\leq 2.8 \text{ ps/nm.km}$<br>$\leq 18 \text{ ps/nm.km}$                                                                                     |
|                                                   | Zero dispersion wavelength                                                                                              | 1300~1322nm                                                                                                                                                                  |
|                                                   | Zero dispersion slope                                                                                                   | $\leq 0.092 \text{ ps/nm}^2.\text{km}$                                                                                                                                       |
|                                                   | PMD Link design value                                                                                                   | $\leq 0.08 \text{ ps}/\sqrt{\text{km}}$                                                                                                                                      |
|                                                   | PMD (maximum individual fiber)                                                                                          | $\leq 0.2 \text{ ps}/\sqrt{\text{km}}$                                                                                                                                       |
| Mechanical Characteristics                        | Proof test level                                                                                                        | 100 kpsi (0.69Gpa).                                                                                                                                                          |
|                                                   | Coating strip (Nominal)                                                                                                 | 3.0 N/3cm                                                                                                                                                                    |
| Environmental Characteristics<br>(Uncabled fiber) | Temperature dependence<br>(-60℃~+85℃)                                                                                   | $\leq 0.05\text{dB/km}$ (@1310nm/@1550nm)                                                                                                                                    |
|                                                   | Temperature-Humidity Cycling<br>(-10℃~+85℃/98% relative humidity)                                                       | $\leq 0.05\text{dB/km}$ (@1310nm/@1550nm)                                                                                                                                    |

● Optical Properties of ITU-T G.657A1 (LBRF: Low Bending Radius Fiber)

| Items of Properties                            |                                                                   | Value                                                   |
|------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------|
| Geometrical Characteristics                    | Effective group index (step index)<br>@1310nm                     | 1.468                                                   |
|                                                | @1550nm & 1625nm                                                  | 1.469                                                   |
|                                                | Mode field diameter @1310nm                                       | $9.0 \pm 0.4 \mu\text{m}$                               |
|                                                | Core/Clad concentricity error                                     | $\leq 0.5 \mu\text{m}$                                  |
|                                                | Cladding diameter                                                 | $125 \pm 0.7 \mu\text{m}$                               |
|                                                | Cladding non-circularity                                          | $\leq 0.7 \%$                                           |
| Optical Characteristics                        | Coating diameter (Uncolored)                                      | $245 \pm 5 \mu\text{m}$                                 |
|                                                | Cutoff wavelength ( $\lambda_{cc}$ )                              | $\leq 1260\text{nm}$                                    |
|                                                | Attenuation coefficient<br>@1310nm Maximum (Average)              | $\leq 0.35 \text{ dB/km}$ ( $\leq 0.34 \text{ dB/km}$ ) |
|                                                | @1383nm Maximum                                                   | $\leq 0.31 \text{ dB/km}$                               |
|                                                | @1550nm Maximum (Average)                                         | $\leq 0.22 \text{ dB/km}$ ( $\leq 0.20 \text{ dB/km}$ ) |
|                                                | @1625nm Maximum                                                   | $\leq 0.24 \text{ dB/km}$                               |
|                                                | Bending loss (@1550nm/@1625nm)<br>Φ 30mm mandrel, 10 turns        | $\leq 0.25 \text{ dB}$ / $\leq 1.00 \text{ dB}$         |
|                                                | Φ 20mm mandrel, 1 turn                                            | $\leq 0.75 \text{ dB}$ / $\leq 1.50 \text{ dB}$         |
|                                                | Attenuation uniformity                                            | $\leq 0.05 \text{ dB}$                                  |
|                                                | Chromatic dispersion coefficient<br>@1285~1330nm                  | $\leq 3.2 \text{ ps/nm.km}$                             |
|                                                | @1290~1330nm                                                      | $\leq 2.8 \text{ ps/nm.km}$                             |
|                                                | @1550nm                                                           | $\leq 18 \text{ ps/nm.km}$                              |
| Mechanical Characteristics                     | Zero dispersion wavelength                                        | 1300~1322nm                                             |
|                                                | Zero dispersion slope                                             | $\leq 0.092 \text{ ps/nm}^2.\text{km}$                  |
|                                                | PMD Link design value                                             | $\leq 0.08 \text{ ps}/\sqrt{\text{km}}$                 |
| Environmental Characteristics (Uncabled fiber) | PMD (maximum individual fiber)                                    | $\leq 0.2 \text{ ps}/\sqrt{\text{km}}$                  |
|                                                | Proof test level                                                  | 100 kpsi (0.69Gpa)                                      |
|                                                | Coating strip (Nominal)                                           | 3.0 N/3cm                                               |
| Environmental Characteristics (Uncabled fiber) | Temperature dependence<br>(-60℃~+85℃)                             | $\leq 0.05\text{dB/km}$ (@1310nm/@1550nm)               |
|                                                | Temperature-Humidity Cycling<br>(-10℃~+85℃/98% relative humidity) | $\leq 0.05\text{dB/km}$ (@1310nm/@1550nm)               |

**Flame Retardant, Mini Type\_ Optical Fiber Cable (MINI\_LSZH Sheath)**

- ITU-T G.652D, LWPF (Low Water Peak Fiber), [ 24C, 48C, 96C ]
- ITU-T G.657A1 LBRF (Low Bending Radius Fiber), [ 24C, 48C, 96C ]

**Revision Table**

| Rev. No | Date        | Page | Description                                                                                                                                                                                                                                                                                                |
|---------|-------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R0      | Sep.10.2020 | 1~4  | Initial release<br>Spec No : MC-2020-DUCATEL-MINI_LSZH(48C)-R0<br>- G.652D 48C                                                                                                                                                                                                                             |
| R1      | Nov.21.2022 | 1~5  | <ul style="list-style-type: none"><li>● Add the 24c, 96c cable</li><li>● Add the Optical Properties of ITU-T G.657A1</li></ul> Spec No : MC-2020-DUCATEL-MINI_LSZH(24~96C)-R1<br>- G.652D 24, 48, 96C<br>- G.657A1 24, 48, 96C<br><br><ul style="list-style-type: none"><li>● Add Revision Table</li></ul> |
|         |             |      |                                                                                                                                                                                                                                                                                                            |