

## Order Information

**INDOOR-OUTDOOR OFC-ADSS-MM (OM2) (50/125) LOOSE TUBE-BLACK (LSZH-FR)**

| Number of Fiber | 6 Core   | 12 Core  | 24 Core  | 48 Core  |
|-----------------|----------|----------|----------|----------|
| Part Number     | 64760006 | 64760012 | 64760024 | 64760048 |

1. General  
Scope

This specification covers the construction and properties of 50/125 um Multimode (Graded-index, OM2) all-dielectric self-supporting (ADSS), single jacket, dry core loose tube fiber optic cable. The cable sheath is composed of a smooth low smoke, zero halogen and flame retardant.

## Quality Assurance

Furukawa takes pride in being an industry leader recognized for producing a quality product. To ensure a continuing level of quality in production cables, consistent quality systems with ISO 9001 "Quality Management System", and ISO 14001 "Environment Management System" are provided for all optical fiber and fiber optic cables.

Furukawa is supported by standards such as

- Electronic Industries Association (EIA)
- Telecommunications Industry Association (TIA)
- International Telecommunications Union (ITU)
- International Electrotechnical Commission (IEC)
- American Society for Testing and Materials (ASTM)
- ISO/IEC 11801, ANSI/TIA 568-C.3, Telcordia (Bellcore) GR-20-CORE, ITU G.651, ICEA 596, 696 ICEA

FURUKAWA is supported application for IEEE 802.3z, Gigabit Ethernet, IEEE 802.3ae, 10Gigabit Ethernet, ATM, FDDI, Fiber Channel, CATV, FTTX.

All of optical fiber cable element should comply with RoHS Directive 2002/95/EC and its amendment directives with the Laboratory that fully comply with the requirements of ISO/IEC 17025-05, The Basic Rules, IEC 01: 2008-11 and Rules of Procedure IEC 02: 2008-10, and the relevant IEC CB-Scheme Operational Documents

## General Fiber Optic Cable Characteristics

High quality optical fibers made with pure silica-based glass have very low loss for infrared wavelengths and can be used to carry large amounts of information for very long distances in optical communication systems. High fiber strength is obtained by protecting the surface of the glass fiber with thin coating layers of polymeric materials.

The coated Fibers are then placed in cable structures having additional layers to protect the fiber during the rigors of outside plant installation and to provide long term reliable operation in the outside plant environment. The design philosophy in meeting these objectives is to provide high quality, rugged, well-tested fiber optic cables, which are compact and have a high strength-to-weight ratio. Compact fiber optic cables are easier to handle and install in the field and provide longer length for field installation.

2. Optical Fiber Requirements

Furukawa 50/125  $\mu\text{m}$  fiber is a graded index multimode optical fiber with a 50  $\mu\text{m}$  core diameter and a 125  $\mu\text{m}$  cladding diameter. Furukawa 50/125 fiber is specified for operation at the 850 nm and/or 1300 nm wavelengths

Furukawa Fibers feature a dual UV curable acrylate coating system, which provides unparalleled performance in a wide range of environmental conditions. The advantages of this coating structure are excellent resistance to micro-bending induced losses, superior hydrolytic stability and long term preservations of color code integrity. The coating is easily strippable using mechanical methods.

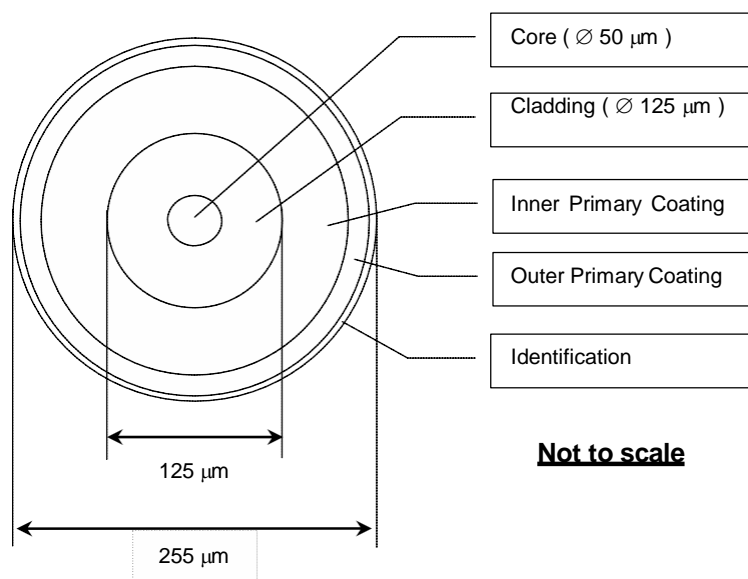


Fig. 1 Cross Section View of Multimode Fiber (50/125, Graded-index)

Table 1. Multimode Fiber (50/125, Graded-index, OM2) Characteristics

| <b>Fiber attributes</b>  |   |
|--|---|
| <b>Item</b>  | <b>Description</b>  |
| Refractive Index Profile   | Graded Index  |
| Coating  | Dual layer UV-Cured Acrylate Coat   |
| Core Diameter  | 50 ± 2.5 μm   |
| Group refractive index *   | 1.483 @ 850 nm<br>1.479 @ 1300 nm   |
| Cladding Diameter  | 125 ± 1 μm  |
| Core Non-Circularity   | ≤ 5 %   |
| Cladding Non-Circularity   | ≤ 1 %   |
| Coating Diameter   | 245 ± 5 μm  |
| Colored Fiber Diameter   | 255 ± 10 μm   |
| Core/Cladding Concentricity error                                | ≤ 1.5 μm  |
| Coating Non-Circularity  | ≤ 5 %   |
| Coating/Cladding Concentricity error                             | ≤ 6 μm  |
| Proof test stress  | 100 kpsi (0.69 Gpa)   |
| Zero-Dispersion Wavelength                                       | Between 1297 and 1316 nm  |
| Zero-Dispersion Slope  | ≤ 0.101 ps/(nm <sup>2</sup> .km)  |
| Numerical Aperture (NA)  | 0.200 ± 0.015   |
| Bandwidth  | ≥ 500 MHz.km @ 850 nm<br>≥ 500 MHz.km @ 1300 nm                                     |
| Bending Loss<br>(100 turns, D=75 mm)                             | ≤ 0.5 dB @ 850 & 1300 nm  |
| Coating Strip Force<br>(@ 0 °C to +45 °C)                        | 3.0 N (mean)<br>2.2 N ≤ F ≤ 4.4 N   |
| <b>Cable attributes</b>  |   |
| <b>Item</b>  | <b>Description</b>  |
| Attenuation Coefficient (cable)                                  | Max. 2.7 dB/km, Typ. 2.5 dB/km @ 850 nm<br>Max. 0.8 dB/km, Typ. 0.7 dB/km @ 1300 nm |
| Attenuation at 1380 nm minus<br>attenuation at 1300 nm           | ≤ 1.5 dB/km   |
| Attenuation Uniformity / Point<br>Discontinuities, 850 & 1300 nm | ≤ 0.1 dB  |

\* Optical time domain reflectometers (OTDRs) require the setting of the fiber's group refractive index in order to calculate and display distance. The above is a group refractive index values for OTDR settings.

**3. Cable Core / Cable Characteristics and Construction**

These core/cable combinations are described in detail below.

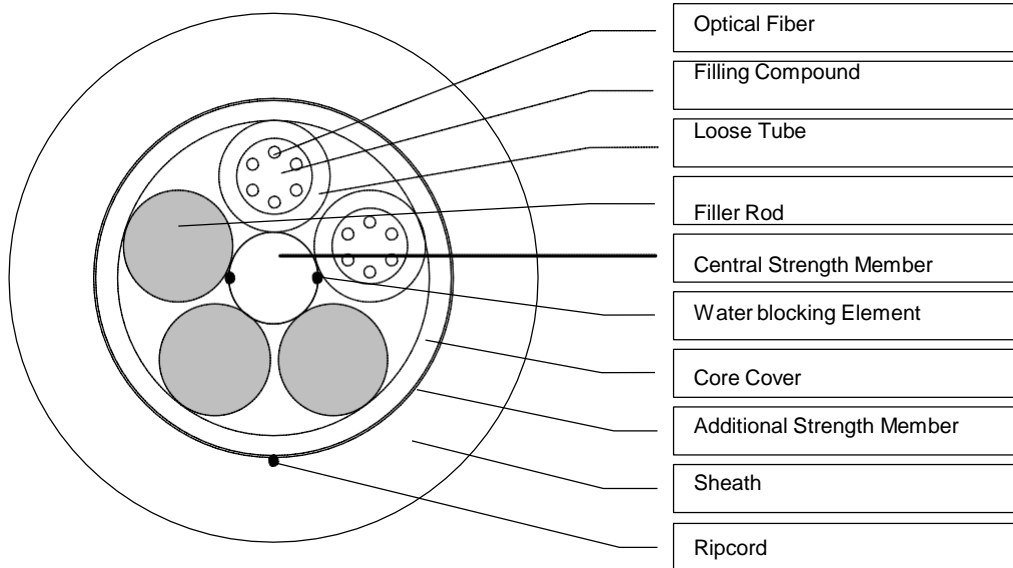
Table 2. Constructions of all-dielectric self-supporting (ADSS) single jacket, dry core loose tube fiber optic cable.

| Item                         |                | Description   |                |
|------------------------------|----------------|---|----------------|
|                              |                | Up to 30 Fibers   | 36 ~ 60 Fibers |
| Optical Fiber                | Construction   | Table 1   |                |
| Filling Compound             | Material       | Thixotropic Jelly Compound  |                |
| Loose Tube                   | Material       | (PBT) Polybutylene Terephthalate with color code  |                |
|                              | Fiber per Tube | Max. 6  | Max. 12        |
|                              | Number         | 1 ~ 5   | 3 ~ 5          |
|                              | Assembly       | Fibers are brought together with the filling compound and placed in the extruded tube   |                |
| Filler Rod                   | Material       | Polyethylene, natural color   |                |
|                              | Number         | 0 ~ 4   | 0 ~ 2          |
| Stranding                    | Method         | Reverse oscillating lay (ROL) technique (SZ Direction)  |                |
| Central Strength Member      | Material       | FRP (Fiberglass Reinforce with Plastic)   |                |
| Water Blocking Element       | Material       | Suitable Water Swellable Materials (Dry-Core Technology)  |                |
| Core Covering                | Material       | Water Blocking tape   |                |
|                              | Assembly       | The tape shall be wrapped longitudinally over the cable core  |                |
| Additional Strength Member   | Material       | Aramid yarns  |                |
|                              | Number         | The quantity of additional strength member shall be selected to minimize cable cost while meeting the performance requirement of the cable applications |                |
| Ripcord                      | Material       | Polyester cord  |                |
| Sheath                       | Material       | Low Smoke, Zero-Halogen and Flame Retardant   |                |
|                              | Thickness      | Nominal 1.4 mm  |                |
| Cable Diameter (Approx.) mm  |                | 9.5   | 10.5           |
| Cable Weight (Approx.) kg/km |                | 65  | 80             |
| Structure                    |                | Fig. 3  |                |

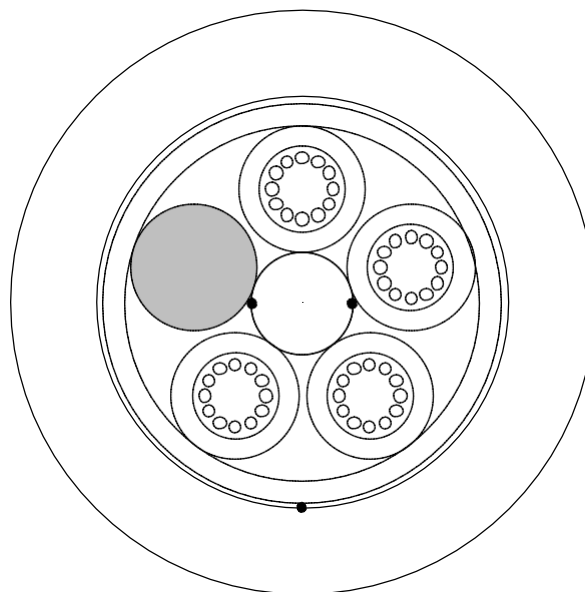
**Note:**

- The thickness of the thinnest point shall not be measured at the groove of the ripcord.
- Manufacturer may use additional suitable tape(s), thread(s) or dielectric elements into suitable place in the cable for manufacturer's reason.

12 Fibers



48 Fibers



**Not to scale**

Fig. 3 Cross-section view of all-dielectric self-supporting (ADSS) single jacket, dry core loose tube fiber optic cable.

Table 3. TIA/EIA-598-A Color Code for Fiber and Loose tube Identification

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

**Note:** - All fibers and tube used in our cables are color code to facilitate individual identification. Unless otherwise specified, all cables employ the standard industry color code system in accordance with the Munsell color shades as specified in EIA/TIA-359 and EIA/TIA-598A (Rose and Aqua color recommended standard TIA/EIA-598-B), Color Coding of Fiber Optic Cables. Anyway, the color code can be changed by customer's request.

- Unless otherwise requested by the customer, all cable jackets are black.

Table 4. Mechanical Specification of the cable

| Item  |                                 | Specification                   |
|---|---------------------------------|---------------------------------|
| Maximum Span Length                         |                                 | 40 m                            |
| Minimum installation Sag                    |                                 | 0.5% of Maximum Span Length     |
| Maximum Wind Velocity                       |                                 | 100 km/hr                       |
| Maximum tensile load installation/Operation |                                 | 1,200/600 N                     |
| Installation/Operation Temperature          |                                 | - 40°C to + 70°C                |
| Storage/Shipping Temperature                |                                 | - 40°C to + 75°C                |
| Minimum bending Radius                      | During Installation Or handling | 15 x External Diameter of Cable |
|   | During Service Or fixed         | 10 x External Diameter of Cable |

**Note:** The maximum allowable pulling tension is the greatest pulling force that can be applied to a cable during installation without cable damage.

**4. Mechanical and Environmental Test Requirements.**

This section covers the mechanical and environmental test for the cable.

Table 5. Mechanical, Environmental Test Requirements for the cables

| <b>Item</b>              | <b>Specification</b>   | <b>Method</b>   |
|--------------------------|--|---|
| Torsion Test             | 0.20 dB Max. Mean Added Loss at 1300 nm. No cable jacket cracking or splitting.                      | TIA/EIA-455-85A or IEC-60794-1-E7<br>Test sample; 2 m Maximum Load; per table 2, EIA-455-85A<br>Rotation; $\pm 180$ degree, 5 cycles  |
| Tensile Performance Test | 0.20 dB Max. Mean Added Loss at 1300 nm at rated tensile load.                                       | IEC-60794-1-E1A<br>Test sample; 25 m Minimum Sheave Dia.; 480 mm (Universal)<br>Load; maximum rated tensile load<br>Duration ; 1 hr   |
| Impact Test              | 0.40 dB Max. Mean Added Loss at 1300 nm.   | TIA/EIA-455-25B or IEC-60794-1-E4<br>Starting Energy; depend on cable diameter, per Table 1 EIA/TIA-455-25B<br>Number Impact; 25<br>Test sample; Approx. 20 m   |
| Repeated Bending Test    | 0.20 dB Max. Mean Added Loss at 1300 nm. No cable jacket cracking or splitting.                      | TIA/EIA-455-104A or IEC-60794-1-E6<br>Sheave Dia.; 20 x cable dia.<br>Number Cycles ; 25<br>Load; per Table 2, EIA-455-104A<br>Test Sample ; Approx. 20 m   |
| Compression Test         | 0.20 dB Max. Mean Added Loss at 1300 nm. No cable jacket cracking or splitting.                      | TIA/EIA-455-41A or IEC-60794-1-E3<br>Load; 2,200 N(220N/cm)<br>Duration; 10 minutes<br>Test sample ; Approx.20 m  |
| Cable Bending Test       | 0.20 dB Max. Mean Added Loss at 1300 nm. No cable jacket cracking or splitting.                      | IEC-60794-1-E11B<br>Mandrel Diameter: 20 x cable dia.<br>Cycles : 1   |
| Water Penetration Test   | No fluid leakage through the open cable end after 1 hour.  | EIA-455-82B or IEC-60794-1-F5<br>Fluid Pressure; 1m static head or equivalent pressure.<br>Test sample ; 3 m<br>Duration ; 1 hour   |
| Temperature Cycling Test | 0.50 dB/km Max. Mean Added Loss at 1300 nm at operating temp. No cable jacket cracking or splitting. | TIA/EIA-455-3A or IEC-60794-1-F1<br>Time at Temp. ; At least 16 hr. Each Temp.<br>Temp. Range ; -40°C ( $\pm 2^\circ\text{C}$ ) Minimum<br>+70°C ( $\pm 2^\circ\text{C}$ ) Maximum<br>Number of Cycles; Not less than 1 cycle |

Table 6. Fire performance requirements

| <b>Item</b>       | <b>Method/Requirement</b>  |
|-------------------|--|
| Flame Propagation | (a) The cable shall be flame retardant and shall comply with the requirements of IEC60332: Part 1 for tests on single cable under fire conditions when tested in accordance with that standard<br>(b) The cable shall be flame retardant and shall comply with the requirements of IEC60332: Part 3 Category C for tests on bunched cable under fire conditions when tested in accordance with that standard |

## 5. Cable Marking and Shipping Requirements

### 1. Sheath marking

The sheath marking is available upon customer's request. The sheath marking shall be printed (Hot Stamp) on the outer sheath of the cable with white color in one-meter intervals.

### 2. Reels

1. The cable will be delivered at the required length on a wooden reel. The reels are designed to prevent damage to the cable during shipment and installation.
2. The cable shall be delivered on wooden reel in standard manufacturing length of 4,000 m. (Special length is available upon request, but the cost may be increased.)
3. The diameter of the barrel shall be not less than 30 times of the outer diameter of the cable.
4. Circumference shall be completely enclosed with wooden battens, these battens shall be secured by nails to each flange. There are metallic bands are strapped about the wooden batten to help secure the battens to the reel.
5. To provide access for testing, the inner end of the cable protrudes through the inside of the reel. The end is securely kept on the side of the flange to protect it during transport and storage. The length of the inner end is typically 1 meter. The cable ends are securely fastened so as not to protrude beyond any portion of the reel in an unprotected manner and to prevent the cable from becoming loose in transport.

### 2. Sealing and Cable Termination

The both end of the cable shall be sealed with a suitable rubber cap or heat shrinkable cap to prevent ingress of moisture.

### 4. Information Accompanying the Reel

The following information is securely attached to the reel.

- |  |                |
|--|----------------|
| - Manufacturer's Name                  | - Drum No.     |
| - Customer's Name                      | - Reel ID.     |
| - Customer Order Number                | - Ship Length  |
| - Customer Part Number (if Applicable) | - Gross Weight |
| - Kind & Size (Cable Description)      | - Net Weight   |
| - Order Length                         | - Date         |
| - Outside sequential                   |                |
| - Inside sequential                    |                |

**- END OF SPECIFICATION -**