

Ultra-High-Fiber-Count Optical Fiber Cable with High-Strength Jacket

1. Outline

In recent years in Japan, behind the widespread use of cloud computing, data center networks serving as a fundamental technology have been handling an increasing amount of data transmission, which also lead to a growing for increased ultra-high-fiber-count and higher-density cables. Sumitomo Electric Industries, Ltd. has successfully commercialized the world's first cable containing 3456 or more fibers and shipped it to its many customers.

Meanwhile in the overseas telecom market, development of optical fiber cables has been following the market trend for higher fiber counts and higher density due to conduit restrictions and other reasons. Needs for optical fiber cables containing about 2000 fibers have already arisen. With respect to overseas telecom applications, certain customers prioritize on the connectivity between the new installation and their existing lines. Customer prefers ITU-T G.652.D fibers with a nominal mode field diameter (MFD, refers to optical core diameter) of $9.2\ \mu\text{m}$ instead of the high-flexural strength single-mode fibers with a nominal MFD of $8.6\ \mu\text{m}$ (complying with ITU-T G.657.A1 and G.652.D) currently used in ultra-high-fiber-count cables. Moreover, there are strong demand for steel tape-armored optical fiber cables for outdoor applications in Asia as countermeasure against attacks by rats and other rodents.

This paper describes a 2016-fiber slotted-core optical fiber cable with a high strength jacket for protection from rodents, developed using $9.2\ \mu\text{m}$ MFD general-purpose fibers and, for a high density, a pliable ribbon structure (herein after called Freeform Ribbon).

2. Structure

The newly developed structure is Freeform Ribbon compatible with eight fiber ribbons frequently used in the Asian region, as shown in Fig. 1. The flexibility and tape alignment for mass splicing of Freeform Ribbon have been optimized by varying the ratio of the separated part to the non-separated part and their lengths, thereby achieving a remarkable improvement in the density of fibers housed, from previous models.

The adopted cable structure is a slotted-core structure, which is non-directional in bending and exhibits superb flexibility, using a high-tensile strength steel-wire strength member at the center. The newly developed structure features one slot that accommodates both copper wires and optical fibers because it was necessary to meet the customer's request for inclusion of copper wires intended for gas

maintenance. Figure 2 presents a cross section of the optical fiber cable. For applications that do not need to use copper wires, the cable can be extended up to 2304 fibers.

In addition, the flame retardant and low smoke structure was developed in consideration of indoor application.

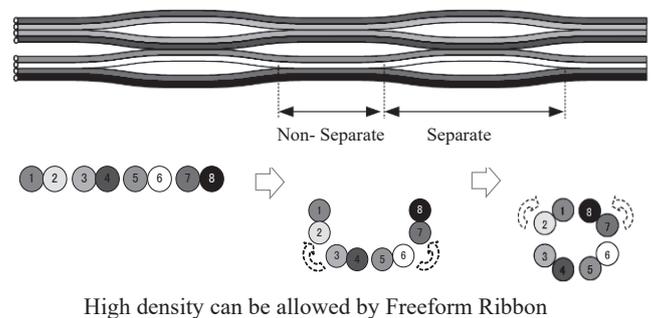


Fig. 1. The schematic of Freeform Ribbon

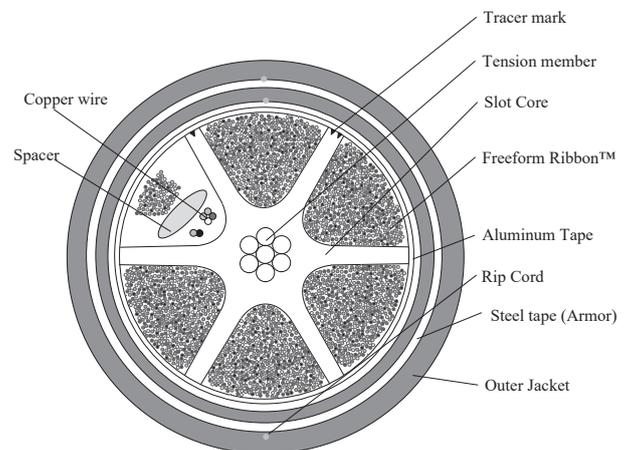


Fig. 2. Cross section of 2016-fiber optical fiber cable

3. Features

- (1) Both high fiber count/high density and armoring achieved: Use of Freeform Ribbon structure enables the cable to contain more than 2000 fibers, being more than doubled in fiber count from existing 1000-fiber armored optical fiber cable 35 mm in outside diameter.

- (2) A high level of compatibility for splicing with existing lines: This newly developed cable uses the same as 9.2 μm MFD general-purpose fibers in the existing lines. Therefore, this cable when spliced with an existing line is less likely to cause optical time-domain reflectometry level differences arising from an MFD mismatch.
- (3) Protection from rodents: The double jacket with steel tape structure, conventionally proved, is used to construct the ultra-high-fiber-count cable.
- (4) Excellent fire safety: A flame retardant and low smoke cable design is used to provide the excellent fire safety compliance with the international IEC and Telcordia requirements.
- (5) Use of copper wires for gas maintenance for protection from water penetration: The optical fiber cable uses a slot structure to accommodate optical fibers together with copper wires. This copper wire can be used with the gas maintenance system to detect any sheath fault and alert for any potential risk of water penetration into the cable core.

• Freeform Ribbon is a trademark or registered trademark of Sumitomo Electric Industries, Ltd.