

190 μm Freeform Ribbon-Mounted 864-Fiber Microduct Optical Cable

1. Overview

Currently, data center (DC) construction is progressing to accommodate the rapid increase in traffic due to the emergence of generative AI and machine learning. By interconnecting multiple DCs, data can be shared, and services such as backup and redundancy can be provided. To realize these services, it is necessary to install optical cables in outdoor underground ducts that connect distant DCs, and there is an expectation that many fibers can be efficiently deployed within these space-limited ducts in a short period of time. Against this background, there is a growing demand for lightweight microduct cables that have a small outer diameter and accommodate multiple fibers, which enable quick installation by using blown air.

Sumitomo Electric Industries, Ltd. has developed a smaller Freeform Ribbon that implements the 190 μm fiber, and by applying this to an 864-fiber microduct cable, we have achieved over a 20% reduction in both cable diameter and mass.

2. Features

Figure 1 shows a cross-sectional schematic of the developed 190 μm optical fiber, which complies with the international standards ITU-T G.657.A1 and G.652.D. While reducing the fiber diameter by over 20%, the glass diameter is maintained at 125 μm, ensuring compatibility with conventional optical fibers.

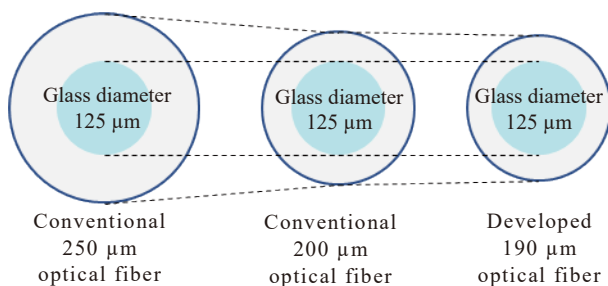


Fig. 1. Schematic cross-section of optical fiber

Figure 2 shows a schematic diagram of the developed 12-fiber Freeform Ribbon (190 μm Freeform Ribbon), which utilizes the 190 μm optical fiber. The Freeform ribbon using developed 190 μm 12 fibers is designed with splits in the longitudinal direction for every two fibers to ensure both flexibility and ease of mass fusion splicing. These features are achieved by optimizing the ratio and length of the split section and the non-split section.

Figure 3 and Table 1 show the schematic diagram and characteristics of the developed 864-fiber microduct optical

cable. Adopting a uni-tube structure as in conventional cables and densely packing 190 μm Freeform Ribbon units reduced the cable diameter to 11 mm. This resulted in reduced cable mass and the minimum bending radius, achieving the small diameter, light weight, and excellent flexibility required for air-blowing methods. It can now be installed in underground ducts with an inner diameter of 13 mm. This cable was tested in accordance with ICEA S-122-744 standard, and compliance with the standard was confirmed.

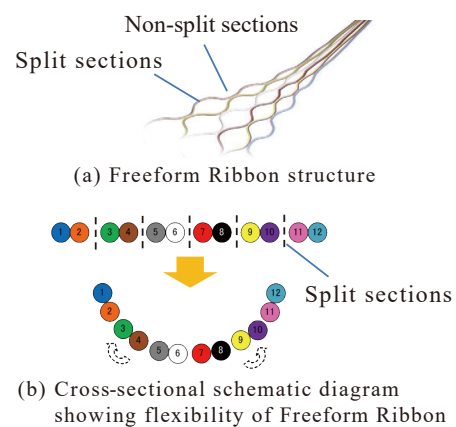


Fig. 2. Schematic diagram of Freeform Ribbon

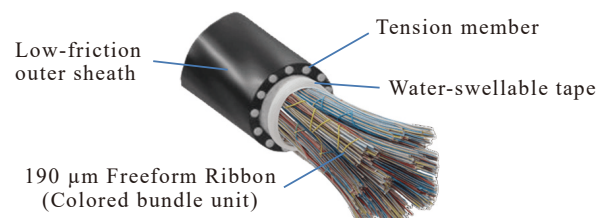


Fig. 3. Schematic diagram of 864-fiber microduct optical cable

Table 1. Characteristics of 864-fiber microduct optical cable

	Conventional product		Developed product
	250 μm	200 μm	190 μm
Optical fiber diameter	250 μm	200 μm	190 μm
Cable diameter	15 mm	14 mm	11 mm
Cable mass	140 kg/km	120 kg/km	100 kg/km
Min. bending radius	300 mm	200 mm	150 mm
Installable duct inner diameter	20 mm	18 mm	13 mm
Mechanical and environmental performance	ICEA S - 122-744		

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