» New Products

# 4000-Fiber Rollable Ribbon Cable With High Tensile Strength for Long Distance Installation

## 1. INTRODUCTION

The data traffic is experiencing a swift increase with the use of Digital Transformation (DX) and Artificial Intelligence (AI), and data centers are required to increase their capacity of optical fiber networks. In Japan, optical fiber cables with 1000 or 2000 fibers are mainly used, but the number of fibers is insufficient to meet the demand to install optical cables capable of high-capacity communication in the limited space of existing conduits, as multiple optical cables have to be laid in an increasing number of situations. Moreover, in Japan, where the land for building data centers is limited, the distances between data centers are often longer than in other countries, and optical fiber cables with high tensile strength are required for long-distance installation. This product was developed to meet the demand for such high-capacity communications, and uses intermittently bonded fiber ribbons (rollable ribbon) to realize a super multi-fiber structure. The structure of this rollable ribbon is not 4- or 8-fiber using 250 µm-diameter optical fiber, which are widely distributed in Japan, but, for the first time in Japan, 16-fiber using 200 µm-diameter fine optical fiber. Also, this product maintains the flexibility of the cable while it uses the tension members that can withstand high tensile force in order to support long-distance installation.

## 2. FEATURES OF ROLLABLE RIBBONS (200 µm 16-FIBER ROLLABLE RIBBON) WITH 16 FINE OPTICAL FIBERS OF 200 µm DIAMETER INTERMITTENTLY BONDED TOGETHER

In order to accommodate more optical fiber cores in the cable and realize a super multi-core structure, a 200 µm 16-fiber rollable ribbon shown in Figure 1 is applied to this product. Intermittent bonded fiber ribbons have a structure that intermittently fixes core fibers together, so their shape can be easily deformed and they can be stored densely inside the cable. The use of the fine optical fibers has enabled a reduction in diameter of the fibers themselves compared to conventional products and has further increased the density in the cable. On the other hand, when the rollable ribbon is removed from the cable, it has the same flat structure as conventional fiber ribbon, therefore, as before, mass fusion splicing is possible. The number of fibers in the rollable ribbon is also set to 16, a multiple of the number of fibers used in the widely distributed 4- and 8-fiber ribbons in Japan, for ease of connection. In the case of batch fusion splicing between rollable ribbon using 200 µm-diameter optical fibers and rollable ribbon using 250 µm-diameter optical fibers, the use of a pitch conversion folder together with our S124M16 fusion splicer shown in Figure 2 allows splicing work to be performed as same as the splicing between 250 µm-diameter optical fibers and reduces fusion splicing times by approximately 25% compared to the splicing of each the 12 fibers.

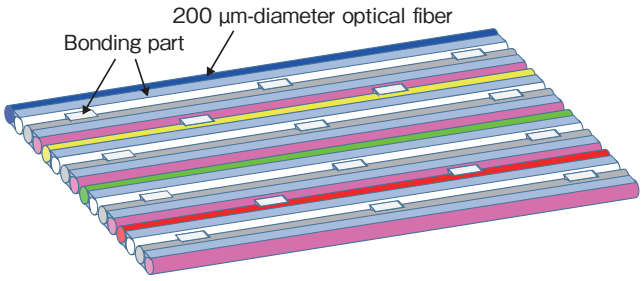


**Figure 1 Structure of a 200 µm 16-fiber rollable ribbon.**


**Figure 2 Fusion splicer for a 16-fiber rollable ribbon (S124M16).**

## 3. STRUCTURE AND CHARACTERISTICS OF A 4000-FIBER ROLLABLE RIBBON CABLE

Figure 3 shows the structure of a 4000-fiber rollable ribbon cable. Ten 16-fiber rollable ribbons are bundled together to form a 160-fiber unit, and 25 of these 160-fiber units are placed in the center of the cable. The outer of the 25 units are wrapped around by a water-absorbent non-woven fabric, and then they are sheathed, together with two strength members and two rip cords. Table 1 shows the performance of this product.

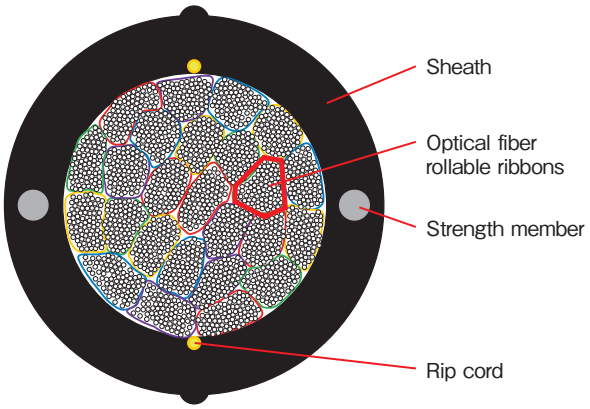


**Figure 3 Structure of a 4000-fiber rollable ribbon cable.**

**Table 1 4000-fiber rollable ribbon cable performance.**

| Test items and conditions | | Result |
|---|---|---|
| Cable outer diameter | | Approx. 27 mm |
| Cable weight | Non-flame retardant/ flame retardant | Approx. 605/690 kg/km |
| Attenuation coefficient | Measurement wavelength 1310 nm | < 0.40 dB/km |
| | Measurement wavelength 1550 nm | < 0.30 dB/km |
| Tensile loading | 6240 N | < 0.05 dB/fiber |
| Cycling flexing | 10 times radius of cable outer diameter | < 0.05 dB/fiber |
| Compressive loading | 1960 N/100 mm × 1 min | < 0.05 dB/fiber |
| Impact resistance | 0.5 kg, 1 m | < 0.05 dB/fiber |
| Temperature cycling | -20°C (flame retardant: -15) – +60°C | < 0.10 dB/km |

Note: Each mechanical and temperature characteristic is evaluated at a measurement wavelength of 1550 nm.

By selecting strength members that can withstand a high tensile force without compromising the flexibility of the cable, the cable has the tensile strength and the mechanical strength to support long-distance installation, and can be installed under the allowable tension even in long-distance conduits connecting data centers in Japan.

## 4. CONCLUSION

This product is a rollable ribbon cable with a super multi-fiber structure using intermittently bonded fiber ribbons technology, and has enough tensile and mechanical strengths to be used for long-distance installation. The intermittently bonded fiber ribbons used for this product has a 16-fiber structure and is designed for connectivity with 4-and 8-fiber optical cables that are commonly distributed in Japan. In addition, although 200 μm-diameter optical fibers are used, the use of a pitch conversion folder together with our S124M16 fusion splicer allows for an operator to splice different diameter fibers as same as the splicing between 250 μm-diameter optical fibers and is expected to contribute to the construction of more efficient optical fiber networks, especially around data centers.

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