Launching High-Density Microduct Optical Fiber Cable with Freeform Ribbons

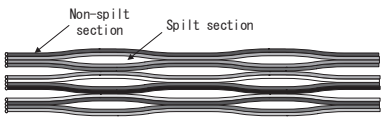
1. Outline

Recently, Communication traffic has been increasing rapidly with the development of cloud computing, video distribution, 5G support, and other IT services. In association with this, there has been an increase in demand for small-diameter, high-fiber-density optical cables in order to overcome physical restrictions of space in ducts. In Europe, North America, and other regions, air-blown optical cables are widely used for FTTH since they make it possible to extend existing conduits (microducts) without additional roadwork, thereby enabling economical network construction. A small-diameter duct used for installing optical cables by blowing compressed air is called a microduct. With the recent increase in transmission capacity and the popularization of FTTH, the need is growing for densely installing a large number of optical fibers into microducts.

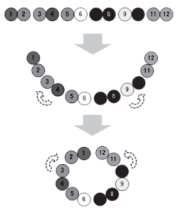
Sumitomo Electric Industries, Ltd. has developed and launched a 432 or fewer count optical fiber cable suitable for air-blowing installation. The new optical fiber cable comprises an intermittent 12-fiber ribbon core made up of 200 µm optical fibers ("200 µm 12-fiber Freeform Ribbon") that are thinner than conventional optical fibers with an outer diameter of 250 µm.

2. Cable Design

The newly developed microduct optical cable is constructed of a 200 µm 12-fiber Freeform Ribbon as shown in Fig. 1 to reduce the cable's diameter and weight. This Freeform Ribbon has a structure with intermittent slits in the longitudinal direction for every two fiber cores. In particular, the ratio and pitch of the split and non-split portions have been optimized to make this fiber ribbon both flexible and suitable for mass fusion splicing. The new fiber ribbon can be spliced not only to another ribbon of the same type, but also to a conventional 250 µm fiber ribbon.



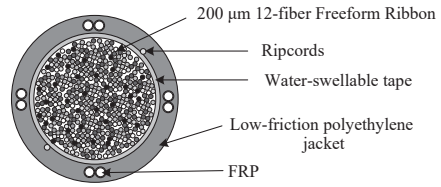
(a) Longitudinal schematic



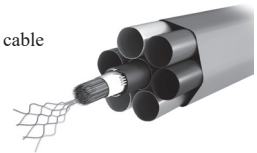
(b) Schematic cross-sectional view illustrating the ribbon's flexibility diagram

Fig. 1. Schematic diagram of 200 µm 12-fiber Freeform Ribbon

The cable structure and microduct are shown in Fig. 2. The cable is thin and lightweight, and FRP members are arranged in four directions at equal intervals to reduce the bending directionality. In addition, the use of a low-friction outer jacket makes the cable easy to install into a microduct by blowing air and handle.



(a) Schematic cross section of 432-fiber microduct optical cable



(b) Schematic illustration of microduct

Fig. 2. Schematic illustration of microduct and optical cable

3. Advantages

(1) Improvement in conduit usage efficiency: The number of optical fiber ribbons per conduit is increased by densifying the cable.
(2) Reduction in duct installation cost: Compared with a cable pulling method, a cable blowing method makes it easy to install longer cables, thereby reducing cable installation cost (see Fig. 3).
(3) Diversified investment: By laying microducts in advance, it is easy to install additional optical cables when demand arises.
(4) Ease of splicing: 12-fiber ribbons can be spliced at once, which reduces the number of connections to 1/12 compared to that for conventional single-core optical cables. Due to its dry core structure, the new optical cable eliminates the need for wiping the jelly off the optical fiber, which has been a problem with conventional single-core cables.

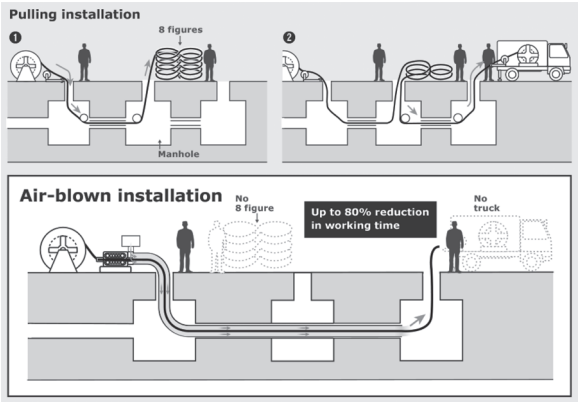


Fig. 3. Comparison of cable blowing method with cable pulling method

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