New Products

Low-Count Optical Premises Cable for Easy Installation

1. INTRODUCTION

Optical premises cables with one to eight fiber counts are typically used for optical fiber installation in private residences and the premises of medium-sized housing complexes. When conventional optical premises cables are to be installed in limited spaces and meandering routes or in certain cable ducts occupied by existing cables, concerns are raised such that a lead-in work would become difficult due to a large friction resistance, and that cable reliability would degrade due to abrasion of the sheath material.

Also, conventional cables usually use a steel wire or aramid fiber-based FRP for their strength member. While a steel wire would make installation in small bending radius difficult and increase the weight, an aramid FRP would break when pulled with a high tension and degrade the reliability of optical fiber, because of its small allowable strength.

To solve these problems, we have recently developed a new optical premises cable with one, two, four and eight cores. The cable uses an abrasion-resistant, low-friction PE material for the sheath, together with a poly(p-phenylenebenzobisoxazole) (PBO)-based FRP materials for the strength member, which is comparable to steel wire in strength, and yet is equivalent to aramid FRP in bendability and mass.

2. FEATURES

The optical premises cable developed here has the following characteristics:

2.1 Low Friction

Figure 1 shows the test method and the evaluation results for dynamic friction coefficients between two sliding cables. It can be seen that the cable developed here reduces the frictional force between cables by 60 to 70 %.

2.2 High Abrasion Resistance

The abrasion resistance of the new cable has been significantly improved by increasing the strength of the sheath material together with by reducing its frictional coefficient. Figure 2 shows the test method for abrasion resistance (JIS C 3005 compliant), and Table 1 the test results.

2.3 High Strength and Handling Performance

Table 2 shows the Young's modulus, bending rigidity and mass of the strength member, as well as the allowable tensile strength of the cable. It is seen that the cable using PBO FRP material has the characteristics that combine the advantages of steel wire and aramid FRP.

3. STRUCTURE

Figure 3 shows the cross-sections of the cable. Every type of cable adopts FlexiWave fiber having a small allow-

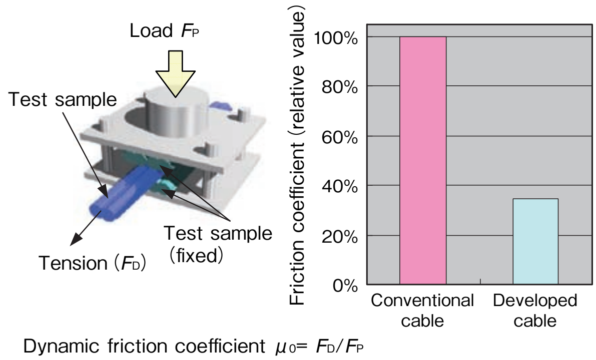


Figure 1 Evaluation of frictional force between cables (1 core).

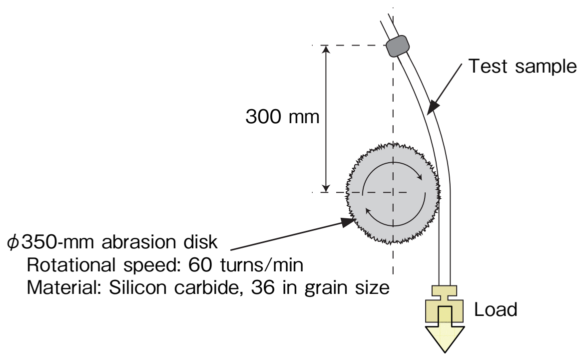


Figure 2 Abrasion resistance test method.

Table 1 Test results of abrasion resistance.

	Conventional cable	Developed cable
Abrasion loss at 2000 turns	1 mm or more in depth, exposing fibers	Approx. 0.20 mm

able bending radius of R=15 mm, as well as the same outer diameter as for the conventional counterpart so as to be adapted to the existing peripheral connecting components.

Table 2 Tensile strength and handling performance of cables.

	ϕ0.5-mm PBO FRP	ϕ0.4-mm steel wire	ϕ0.5-mm aramid FRP
Young's modulus of strength member (MPa)	270	200	109
Bending rigidity at bending diameter of 30 mm (N) *	1.4	1.9	1.3
Mass (kg/km)	8.8	9.7	8.2
Allowable tensile strength (N)	156	151	62

* Measured under IEC60794-1-2 compliant cable conditions.
Note: Horizontal comparison of colored fields shows that PBO FRP combines the advantages of steel wire and aramid FRP.

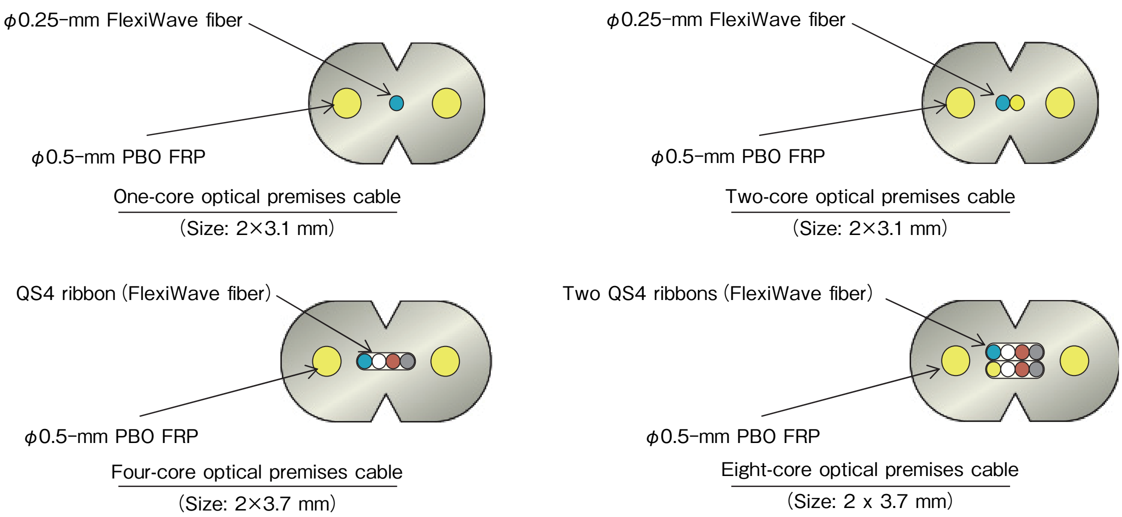
4. CHARACTERISTICS

Table 3 shows the cable characteristics, indicating that the cable has superior performance equivalent to that of conventional cables.

5. CONCLUSION

We have developed the low-count optical premises cable that is superior to conventional cables in terms of reduced friction, improved abrasion resistance and upgraded strength.

For more information, please contact:
Telecommunications Engineering Dept.,
Telecommunications Co.
TEL: +81-3-3286-3440 FAX: +81-3-3286-3190



* Sheath material: Halogen-free, abrasion-resistant, low-friction, flame-retardant polyolefin

Figure 3 Cross sections of cables.

Table 3 Cable characteristics.

Test item	Test condition	One-core	Two-core	Four-core	Eight-core
Transmission loss (dB/km)	at λ =1.31 µm	< 0.35 dB/km	< 0.34 dB/km	< 0.34 dB/km	< 0.34 dB/km
	at λ =1.55 µm	< 0.20 dB/km	< 0.21 dB/km	< 0.21 dB/km	< 0.22 dB/km
Tensile test (loss increase in dB)	at 150 N	< 0.1 dB	< 0.1 dB	< 0.1 dB	< 0.1 dB
Bending test (loss increase in dB)	R=15 mm x 10 cycle (one-core, two-core) R=30 mm x 10 cycle (four-core, eight-core)	< 0.1 dB	< 0.1 dB	< 0.1 dB	< 0.1 dB
Lateral pressure test (loss increase in dB)	1200 N / 25 mm (one-core, two-core) 1960 N / 100 mm (four-core, eight-core)	< 0.1 dB	< 0.1 dB	< 0.1 dB	< 0.1 dB
Impact test (loss increase in dB)	300 g × 1 m	< 0.1 dB	< 0.1 dB	< 0.1 dB	< 0.1 dB
Heat cycle test (loss change in dB/km)	-30～70℃, 10 cycle	< ±0.02 dB/km	< ±0.02 dB/km	< ±0.03 dB/km	< ±0.03 dB/km
Flame retardancy	JIS C 3005, tilted sample	Spontaneously extinguished	Spontaneously extinguished	Spontaneously extinguished	Spontaneously extinguished
	JIS C 3521, vertical tray	Damaged length < 1.8 m	Damaged length < 1.8 m	Damaged length < 1.8 m	Damaged length < 1.8 m

Note: Loss increases for mechanical tests are measured at λ =1.55 μm.