

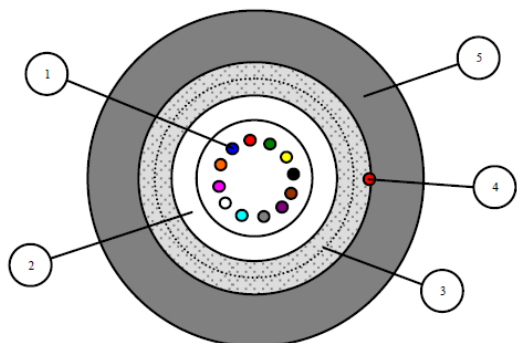
FIBER OPTIC CABLES

CENTRAL LOOSE-TUBE OUTDOOR

CABLE DESCRIPTION – APPLICATIONS

Central loose tube, outdoor, fully dielectric FO cables suitable for drawing or air-blown installation in plastic cable ducts, laying on open or protected trenches or even for direct buried installation in the ground. They are protected against longitudinal moisture penetration through dry, swellable elements. The **double layer of glass yarns** used as strain relief elements provide extra tensile strength, dielectric protection against rodents and prevent peripheral penetration of water. These cables are specially designed for fast and low-cost fiber optic deployment in trunk, urban (metropolitan) or local telecommunication networks and they can be successfully used in any **FTTx** infrastructure.

CABLE DESIGN



Note 1: 12-fiber cable is illustrated
Note 2: drawing is not to scale

- 1. Optical fiber:** coloured glass fiber.
- 2. Loose tube:** PBT tube, filled with jelly compound.
- 3. Reinforcing elements:** **Double** layer of glass yarns with water blocking coating.
- 4. Ripcord:** Polyester or aramide thread of sufficient strength.
- 5. Outer jacket:** Black, UV resistant HDPE.

No. of fibers	4	6	8	12
No. of loose tubes	1	1	1	1
No. of fibers / tube	4	6	8	12
No. of filler elements	-	-	-	-
Outer sheath thickness (nominal) (mm)	1.5	1.5	1.5	1.5
Cable overall diameter (nominal) (mm)	7.5	7.5	8.5	8.5
Cable weight (nominal) (kg/km)	45	45	55	55

CABLE MECHANICAL & ENVIRONMENTAL CHARACTERISTICS

Parameter	Tested according	Specified value	Acceptance criteria
Tensile strength (short term – installation)	IEC 60794-1-2E1	1000 N	$\Delta\alpha < 0.05$ dB reversible, fiber strain < 0.33 %
Tensile strength (long term – operation)	IEC 60794-1-2E1	350 N	$\Delta\alpha < 0.05$ dB reversible, no fiber strain
Crush resistance (short term)	IEC 60794-1-2E3	2500 N/10cm	$\Delta\alpha < 0.05$ dB reversible, no damage
Crush resistance (long term)	IEC 60794-1-2E3	1000 N/10cm	$\Delta\alpha < 0.05$ dB reversible, no damage
Impact resistance	IEC 60794-1-2E4	10 N. m, 3 impacts spaced, R= 30 mm	$\Delta\alpha < 0.05$ dB reversible, no damage
Torsion	IEC 60794-1-2E7	$\pm 180^\circ$, 3 cycles, 50 N	$\Delta\alpha < 0.05$ dB reversible, no damage
Bending (static)	IEC 60794-1-2E11	R= 10 x D, 5 turns, 3 cycles	$\Delta\alpha < 0.05$ dB reversible, no damage
Repeated bending (dynamic)	IEC 60794-1-2E6	R= 15 x D, 100 N, 30 cycles	$\Delta\alpha < 0.05$ dB reversible, no damage
Temperature cycling	IEC 60794-1-2F1	-25°C to +70°C	$\Delta\alpha < 0.05$ dB/km
Water tightness	IEC 60794-1-2F5b	3m cable, 1 m water column, 24 h	no water detected with UV light

Note: all optical power measurements are at 1550nm.

IDENTIFICATION COLOUR CODING

Fiber colours per tube

1	2	3	4	5	6	7	8	9	10	11	12
Red	Green	Yellow	Natural	Brown	Violet	Grey	Turquoise	White	Pink	Orange	Blue

Note: Other fiber and / or tube colour coding can be provided if requested.

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SHEATH MARKING

The following information is printed (hot foil or ink injection method) in contrasting colour, on outer jacket, every one (1) meter:

“ **LOGO** – year of manufacture – number and type of fiber – length marking m”

Other or additional data can be printed on outer jacket if requested.

PACKING

The cables are delivered in non-returnable wooden drums suitable for safe transportation, storage and installation. The outer layer of the cable is 100% protected by a layer of strong battens securely fixed onto the circumference of the flanges. Both cable ends are accessible for testing and tightly covered with shrink-down end caps to prevent ingress of moisture. Cable type, customer, drum no, cable length, net and gross weight are stencilled and / or tagged on drum flanges.

Standard cable length per drum: 2000 ± 100m, 4000 ± 200m or 6000 ± 200m.

Any particular requirements about packing, drum marking, cable length per drum can be provided if requested.

QUALITY CONTROL

All cables are quality tested in every stage of manufacturing procedure (raw materials receive, fiber colouring, fiber buffering, stranding, final cable, packing) to ensure a product of the highest quality level.

Detailed routine test reports (OTDR - attenuation in dB/km) can be delivered for all fibers, for all drums ordered.

BASIC CHARACTERISTICS OF OPTICAL FIBERS

The cables can be ordered with all available categories of single mode and / or multimode optical fibers.

A. SINGLE-MODE OPTICAL FIBERS (typical values)

Parameter	G652B	G652D	G655C	G657A
Cladding diameter	125.0 ± 1.0 µm	125.0 ± 0.7 µm	125.0 ± 0.7 µm	125.0 ± 0.7 µm
Coating diameter (non-colored)	245 ± 5 µm	245 ± 5 µm	245 ± 5 µm	245 ± 5 µm
Core concentricity error	≤ 0.5 µm	≤ 0.5 µm	≤ 0.5 µm	≤ 0.5 µm
Cladding non-circularity	≤ 1.0 %	≤ 1.0 %	≤ 0.7 %	≤ 1.0 %
Coating-Cladding concentricity error	≤ 12 µm	≤ 12 µm	≤ 12 µm	≤ 12 µm
Mode field diameter at 1310nm	9.2 ± 0.4 µm	9.2 ± 0.4 µm	-	8.9 ± 0.4 µm
Mode field diameter at 1550nm	10.4 ± 0.5 µm	10.4 ± 0.5 µm	8.4 ± 0.6 µm	10.0 ± 0.5 µm
Attenuation coefficient at 1310nm	≤ 0.36* dB/km	≤ 0.36* dB/km	-	≤ 0.36* dB/km
Attenuation coefficient at 1383nm	-	≤ 0.33* dB/km	-	≤ 0.33* dB/km
Attenuation coefficient at 1550nm	≤ 0.23* dB/km	≤ 0.23* dB/km	≤ 0.24* dB/km	≤ 0.23* dB/km
Attenuation coefficient at 1625nm	-	≤ 0.26* dB/km	≤ 0.26* dB/km	≤ 0.26* dB/km
Cable cut-off wavelength λ_{cc}	$\lambda_{cc} \leq 1260$ nm	$\lambda_{cc} \leq 1260$ nm	$\lambda_{cc} \leq 1260$ nm	$\lambda_{cc} \leq 1260$ nm
Chromatic dispersion coefficient at 1285-1330 nm	≤ 3.5 ps/(nm·km)	≤ 3.0 ps/(nm·km)	-	≤ 3.5 ps/(nm·km)
Chromatic dispersion coefficient at 1550 nm	≤ 18 ps/(nm·km)	≤ 18 ps/(nm·km)	-	≤ 18 ps/(nm·km)
Chromatic dispersion coefficient at 1530-1565nm	-	-	≤ 2.6 – 6.0 ps/(nm·km)	-
Chromatic dispersion coefficient at 1565-1625nm	-	-	≤ 4.0 – 8.9 ps/(nm·km)	-
PMD individual fiber	≤ 0.2 ps/√km	≤ 0.2 ps/√km	≤ 0.1 ps/√km	≤ 0.2 ps/√km

B. MULTI-MODE OPTICAL FIBERS (typical values)

Parameter	Graded index 62.5/125 OM1	Graded index 50/125 OM2	Graded index 50/125 OM3
Core diameter	62.5 ± 2.5	50 ± 2.5	50 ± 2.5
Cladding diameter	125.0 ± 1.0 µm	125.0 ± 1.0 µm	125.0 ± 1.0 µm
Coating diameter (non-colored)	245 ± 10 µm	245 ± 10 µm	245 ± 10 µm
Core concentricity error	≤ 1.5 µm	≤ 1.5 µm	≤ 1.5 µm
Cladding non-circularity	≤ 1.0 %	≤ 1.0 %	≤ 1.0 %
Attenuation coefficient at 850 nm	≤ 3.0* dB/km	≤ 2.7* dB/km	≤ 2.6* dB/km
Attenuation coefficient at 1300 nm	≤ 1.0* dB/km	≤ 0.9* dB/km	≤ 0.9* dB/km
Bandwidth at 850 nm	200 Mhz. km	500 Mhz. km	1500 / 2000 Mhz. km
Bandwidth at 1300 nm	500 Mhz. km	500 Mhz. km	500 - 500 Mhz. km
Numerical Aperture	0.275±0.015	0.200±0.015	0.200±0.015

*: cabled values

Note: Cables with optical fibers complying with special requirements can be provided if requested.