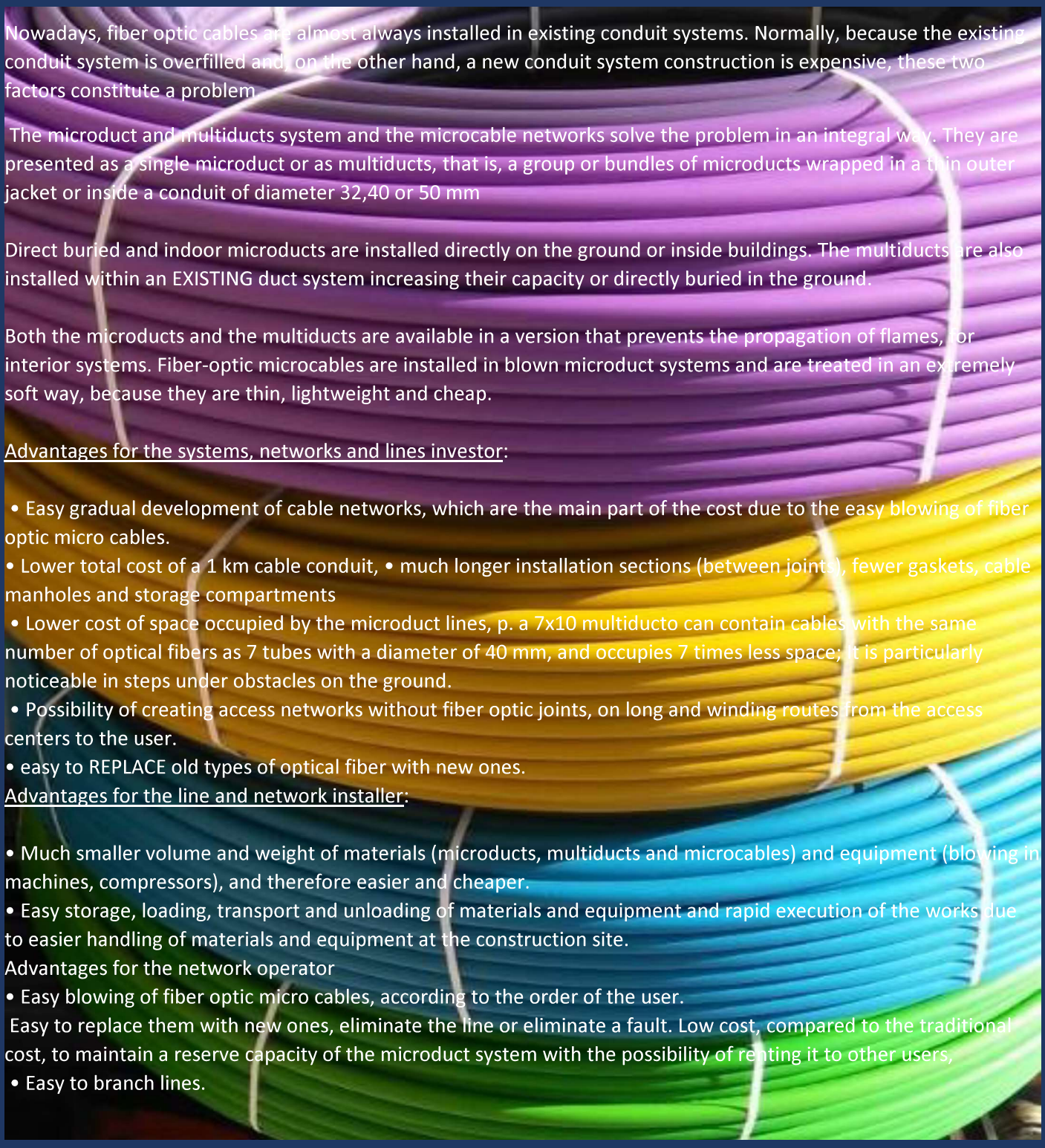
2.3 MICROTUBES Y MULTIDUCTS FOR TELECOMMUNICATIONS- FTTH ---PAG 1/4

2.3.1 GENERALITIES GENERAL OVER PRODUCT AND FTTH



Nowadays, fiber optic cables are almost always installed in existing conduit systems. Normally, because the existing conduit system is overfilled and, on the other hand, a new conduit system construction is expensive, these two factors constitute a problem.

The microduct and multiducts system and the microcable networks solve the problem in an integral way. They are presented as a single microduct or as multiducts, that is, a group or bundles of microducts wrapped in a thin outer jacket or inside a conduit of diameter 32,40 or 50 mm

Direct buried and indoor microducts are installed directly on the ground or inside buildings. The multiducts are also installed within an EXISTING duct system increasing their capacity or directly buried in the ground.

Both the microducts and the multiducts are available in a version that prevents the propagation of flames, for interior systems. Fiber-optic microcables are installed in blown microduct systems and are treated in an extremely soft way, because they are thin, lightweight and cheap.

Advantages for the systems, networks and lines investor:

• Easy gradual development of cable networks, which are the main part of the cost due to the easy blowing of fiber optic micro cables.
• Lower total cost of a 1 km cable conduit, • much longer installation sections (between joints), fewer gaskets, cable manholes and storage compartments
• Lower cost of space occupied by the microduct lines, p. a 7x10 multiducto can contain cables with the same number of optical fibers as 7 tubes with a diameter of 40 mm, and occupies 7 times less space; it is particularly noticeable in steps under obstacles on the ground.
• Possibility of creating access networks without fiber optic joints, on long and winding routes from the access centers to the user.
• easy to REPLACE old types of optical fiber with new ones.

Advantages for the line and network installer:

• Much smaller volume and weight of materials (microducts, multiducts and microcables) and equipment (blowing in machines, compressors), and therefore easier and cheaper.
• Easy storage, loading, transport and unloading of materials and equipment and rapid execution of the works due to easier handling of materials and equipment at the construction site.

Advantages for the network operator

• Easy blowing of fiber optic micro cables, according to the order of the user.
Easy to replace them with new ones, eliminate the line or eliminate a fault. Low cost, compared to the traditional cost, to maintain a reserve capacity of the microduct system with the possibility of renting it to other users,
• Easy to branch lines.

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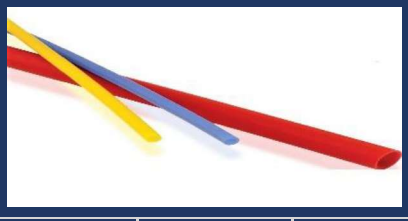
2.3 MICROTUBES Y MULTIDUCTS FOR TELECOMMUNICATIONS- FTTH ---PAG 2/4

2.3.2 MICRODUCTS



Microducts APPLICATION directly buried								
Microduct type TDB			Installation pressure [bar]	Maximum pull force [N]	Impact strength [N/cm]	Min. band radius [mm]	Length [m]	Weight [kg / km]
D.EXT[mm]	D.INT [mm]	Espesor[mm]						
7	4,3	1.35	max. 24	390	>1000	70	5000	23
10	6	2.00		680		100	2000	48
12	8	2.00		840		120	2000	60
14	10	2.00		1010		140	1500	72
16	12	2.00		1150		160	1000	84
Microducts APPLICATION INSIDE OF SUBCONDUCTS installed								
Microduct type TDI			Installation pressure [bar]	Maximum pull force [N]	Impact strength [N/cm]	Min. band radius [mm]	Length [m]	Weight [kg / km]
D.EXT[mm]	D.INT [mm]	Espesor[mm]						
7	5,5	0.75	max. 16	200	>700	70	5000	14
10	8	1.00		380		100	2000	27
12	10	1.00		465		120	2000	33
14	12	1.00		550		140	1500	39
MICRODUCTOS INTERNAL APPLICATION OF BUILDINGS RESISTANT TO FIRE AND UNDER FUMES EMITTER								
Microduct type TFR			Installation pressure [bar]	Maximum pull force [N]	Impact strength [N/cm]	Min. band radius [mm]	Length [m]	Weight [kg / km]
D.EXT[mm]	D.INT [mm]	Espesor[mm]						
7	5,5	0.75	max. 16	240	>700	100	5000	19
10	8	1.00		450		150	2000	29
12	10	1.00		560		180	2000	36
14	12	1.00		690		210	1500	43

Table keys: D.ext= outside diameter (External diameter). D.int = Internal diameter. Espesor= thickness

- PN–EN 61386–1 Conduit systems for cable management. Part 1- General requirements.
- PN–EN 61386–24 Conduit systems for cable management. Part 2-4.
- ZN–30/2008 Micropipes and multipipes for constructing optical fibre microconduit systems. Requirements and tests.
- Customer specification.
- Color and bands to agree. To consult other diámeters y Thicknesses

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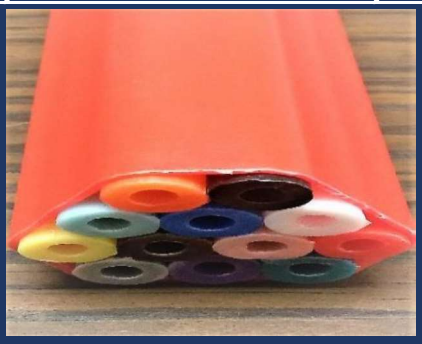
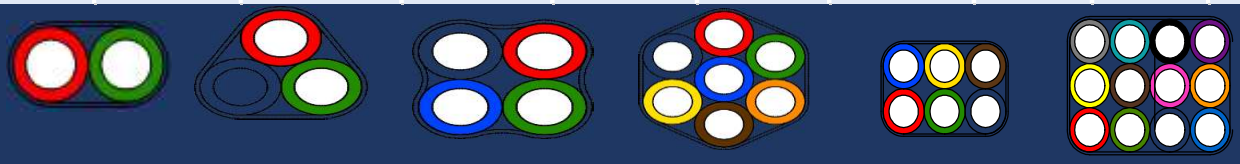
2.3 MICROTUBES Y MULTIDUCTS FOR TELECOMMUNICATIONS- FTTH ---PAG 3/4

2.3.3-Multiducts Bundle o Flat (package of very thick microduct, wrapped in thin polyethylene cover to be directly buried or to put inside existing conduit)



Type	Microducts quantity	Larger diameter of the multiduct (mm)	Smaller diameter of the multiduct (mm)	Installation pressure [bar]	Maximum pull force [N]	Impact strength [N/cm]	Min. band radius [mm]	Length [m]	Weight Kg/Km
	2	15,5	8,5				90	2000	63
	3	15,5	14,5				130	2000	95
	4	15,5	15,5				140	2000	127
	5	19,8	19,2				190	2000	158
7x1.35	7	20,5	22,4	24	390	>1000	225	2000	222
	2	21,5	11,5				120	2000	121
	3	21,5	20,2				180	2000	181
	4	21,5	21,5				190	2000	242
10x2.0	5	27,7	27	24	680	>1000	270	2000	303
	7	28,7	31,4				315	2000	424
	2	25,5	13,5				150	2000	150
	3	25,5	23,9				215	2000	225
	4	25,5	25,5				230	2000	300
12x2.0	5	32	32,9	24	840	>1000	330	2000	375
	7	34,2	37,4				375	1500	525
	2	29,5	15,5				170	2000	179
	3	29,5	27,6				250	2000	268
	4	29,5	29,5				265	2000	358
	5	38,2	37				370	1500	447
14x2.0	7	39,7	43,4	24	1010	>1000	435	1500	626
	10	58	40,3				400	1500	870
	2	33,5	17,5				190	2000	208
	3	33,5	31,4				280	2000	312
	4	33,5	33,5				300	2000	416
16x2.0	5	43,4	42	24	1200	>1000	420	1500	520
	7	45	49,4				500	1500	728



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2.3 MICROTUBES Y MULTIDUCTS FOR TELECOMMUNICATIONS - FTTH ---PAG 4/4

2.3.4 Multiductos Bundle (Thin thickness microduct package, wrapped in protective tube to be directly buried or put inside existing conduit))

Type	microduct quantity	Microduct dimension		Multiduc dimensio t n			Installation pressure [bar]	Maximum pull force [N]	Impact strength [N/cm]	Min. band radius [mm]	Length [m]	Weight [kg / km]
		W (mm)	H (mm)	Dy (mm)	Di (mm)	s (mm)						
32	3	10	1	32	27	2,5	16	3500	20	320	2000	362
	4	10	1									399
38,4	4	12	1	38,4	33,4	2,5	16	3500	20	380	2000	400
	7	10	1	38,4	30	4,2						618
40	3	12	1	40	34	3	16	3500	20	400	1500	554
	3	14	1									583
	4	12	1									599
	5	10	1									597
	7	10	1									660
	10	7	0,75									599
50	4	14	1	50	44	3,5	16	3500	20	500	1500	677
	5	12	1									682
	5	14	1									727
	7	12	1									759
	7	14	1									818
50	5	12	1	50	40,8	4,6	16	3500	20	500	1500	885
	5	14	1									930
	7	10	1									902
	7	12	1									962

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