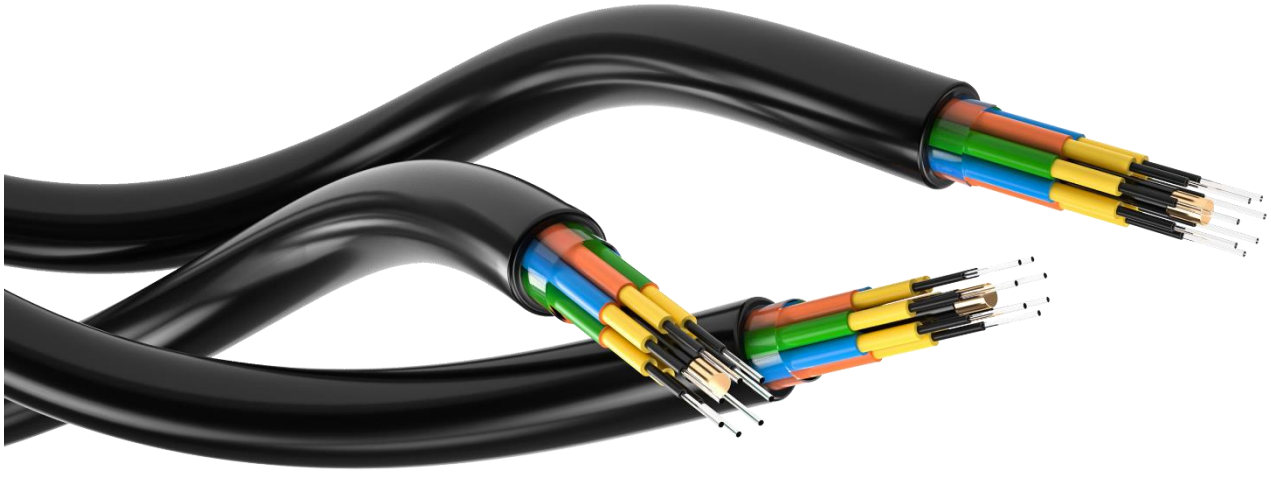
OPTOKON® KABLE

Fiber Optic Cable

Technical Information



CONTENT

Cable Coding

OPK – 1 – 2 3 – 4 (5 × 6) 7 8 – 9 – 10

1

I	Indoor
U	Universal
O	Outdoor

2

CTF	Central tube (gel-filled tube)
CTD	Central tube (dry tube)
SCT	Steel central-tube
MTDD	Multi-tube dry tube/dry core
MTFD	Multi-tube filled tube/dry core
MTFF	Multi-tube filled tube/ filled core
TBT	Buffer (tight strip.)
TBS	Buffer (semi-tight strip.)
TBF	Buffer (free strip.)
SX	Simplex cable
DXK	Duplex circle cable
DXZ	Duplex zip cable
DHX	Heavy duplex cable
DST	Distribution cable
DRP	drop cable
BRF	Breakout without FRP
BRC	Breakout with FRP
SPC	Special construction
SFT	Simplex furcation tubing
DFT	Duplex zip furcation tubing
HCLT	Hybrid Fiber/Copper cable (Loose tube)
HCTB	Hybrid Fiber/Copper cable (Tight buffer)
FTA	Fiber to the Antenna

3

S	Standard
R	Ruggedized
8	Aerial cable fig. 8
F	Flame resistant
TAC	Tactical cable
M	Micro cable
A	Self-support aerial cable
B	Air-Blown Cable
G	Steel central strength member
Cxxx	Distinguishing Number

4

Number of fibres in the cable

5

Number of members in the cable

6

Diameter of members in the cable

7

LT	Loose tube
T5	500 µm FR-LSHF tight buffer
T6	600 µm FR-LSHF tight buffer
F9	900 µm FR-LSHF loose (free) buffer
T9	900 µm FR-LSHF tight buffer
A6	600 µm Acrylate semi-tight buffer
A9	900 µm Acrylate semi-tight buffer
D9	900 µm Acrylate tight buffer
N9	900 µm Polyamide tight buffer
FF	Optical fibre
BT	Tight buffer in loose tube
CFU	Compact Fibre Unit

8

A	Aramid yarn
AA	Double layer of Aramid yarn
G	Glass yarn armouring
GG	Double layer of Glass yarn
X	Corrugated steel tape armouring
F	FRP armouring
L	PEALPE/ALPE tape
Z	Steel wire embedded in jacket
S	Increased thickness of jacket
T	FRP embedded in jacket or laid under jacket
H	FR-LSHF jacket
P	PE jacket
M	Flame resistant tape
N	PA jacket
R	Track-resistant jacket
U	TPU jacket
B	PBT jacket
E	Cu member in cable
Q	UV curable acrylate
Y	Anti-Termite & Anti-Rodent Masterbatch in jacket

9

WH	White
BK	Black
RD	Red
VT	Violet
BN	Brown
BU	Blue
OG	Orange
NT	Natural
PK	Pink
GY	Grey
TQ	Turquoise
GN	Green
YE	Yellow
CR	Ivory / Beige
OL	Olive
LG	Lime Green

10

D	SM 9/125 G.652.D
A1	SM 9/125 G.657.A1
200A1	SM 9/125 G.657.A1 200µm
A2	SM 9/125 G.657.A2
B3	SM 9/125 G.657.B3
655	SM 9/125 G.655.A,B,C,D
656	SM 9/125 G.656
OM1	MM 62,5/125 OM12
OM2	MM 50/125 OM2 BW500/500
OM2+	MM 50/125 OM2 BW600/1200
OM3	MM 50/125 OM3
OM4	MM 50/125 OM4
OM5	MM 50/125 OM5

Colour Coding

Fiber Colour Coding

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

13	14	15	16	17	18	19	20	21	22	23	24
Blue(BS)	Orange(BS)	Green(BS)	Brown(BS)	Grey(BS)	White(BS)	Red(BS)	Natural	Yellow(BS)	Violet(BS)	Pink(BS)	Turquoise(BS)

(BS) – black strip.

Fibers 13-24 have the same colours as fibers 1-12, but they are marked with black stripes. Natural fiber is without black strip.

Tight Buffer Colour Coding

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

Tube Colour Coding – Multitube cable

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

13	14	15	16	17	18
Blue(BS)	Orange(BS)	Green(BS)	Brown(BS)	Grey(BS)	White(BS)

(BS) – black strip.

Tubes 13-18 have the same colours as tubes 1-6, but they are marked with black stripes.

Tube Colour Coding – Unitube cable

1
Natural / White

Secondary Coating Colour in Patch Cord Cables

Simplex

1
Blue

Duplex

1	2
Blue	Orange

Tight Buffered Cables Outer Jacket Colour Coding

G.652.D	G.657.A&B	NZDF	OM1	OM2	OM3	OM4	OM5
Yellow	Yellow	Blue	Orange	Green	Turquoise	Turquoise	Lime Green

Loose Tube Cables Outer Jacket Colour Coding

Outdoor Cables	Universal Cales
Black	Black

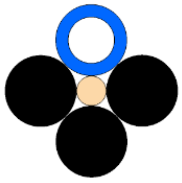
TPU jackets colour

Black	Olive	Beige (Sand)	White

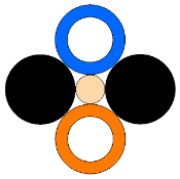
Using Fillers in Multitube Cables

4 elements in the cable

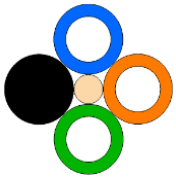
1 active tube



2 active tubes

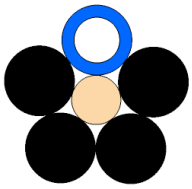


3 active tubes

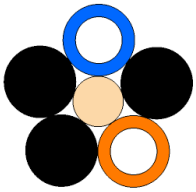


5 elements in the cable

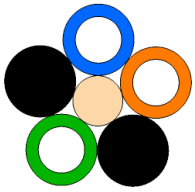
1 active tube



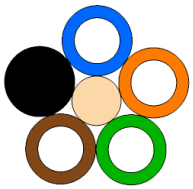
2 active tubes



3 active tubes

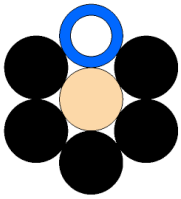


4 active tubes

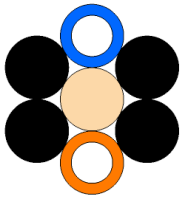


6 elements in the cable

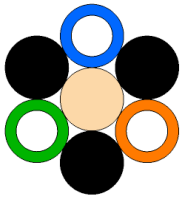
1 active tube



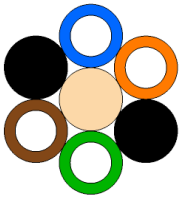
2 active tubes



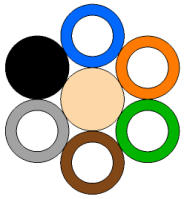
3 active tubes



4 active tubes

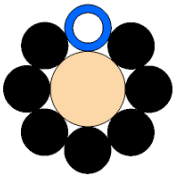


5 active tubes

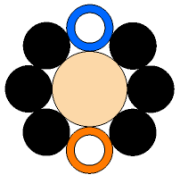


8 elements in the cable

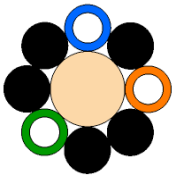
1 active tube



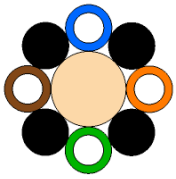
2 active tubes



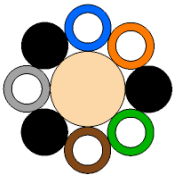
3 active tubes



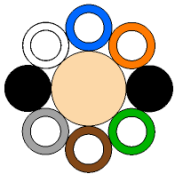
4 active tubes



5 active tubes



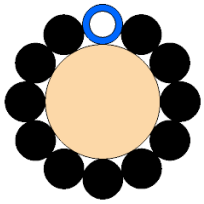
6 active tubes



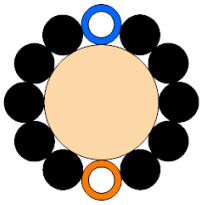
7 active tubes

12 elements in the cable

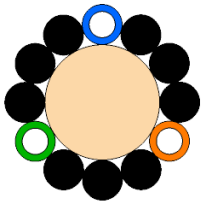
1 active tube



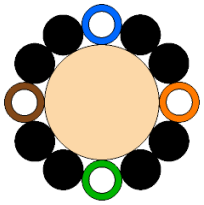
2 active tubes



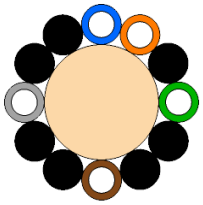
3 active tubes



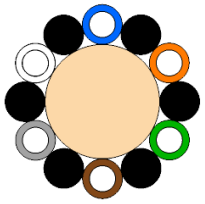
4 active tubes



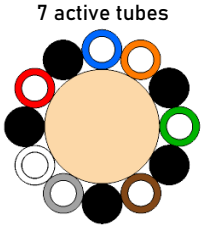
5 active tubes



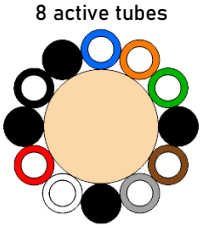
6 active tubes



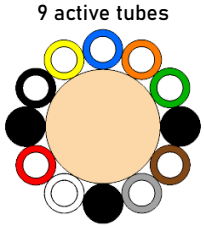
7 active tubes



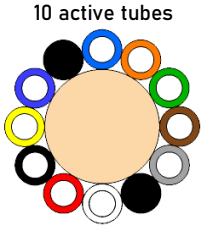
8 active tubes



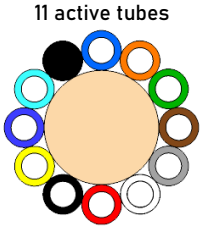
9 active tubes



10 active tubes



11 active tubes



Optical fibers

SMF G.652.D

Fiber	G.652.D
OPK code	D
Core	Germanium doped silica
Cladding	Silica, step index and matched clad type
Coating	Dual layers of UV-cured acrylate
Optical Characteristics	
Attenuation coefficient Loose tube Cables (typical / max.) [1,2]	
at 1310 nm	0.32 / 0.36 dB/km
at 1550 nm	0.19 / 0.24 dB/km
at 1625 nm	0.22 / 0.26 dB/km
Attenuation coefficient Tight Buffered Cables (typical / max.) [1,2]	
at 1310 nm	0.35 / 0.40 dB/km
at 1550 nm	0.25 / 0.40 dB/km
Attenuation discontinuity [2]	≤ 0.1 dB
Cable cut-off wavelength (λcc)	≤ 1260 nm
Zero dispersion wavelength	1302–1322 nm
Zero dispersion slope	≤ 0.090 (ps/(nm^2/km)
Chromatic dispersion at 1285 ~ 1330 nm	≤ 3.5 ps/(nm.km)
Chromatic dispersion at 1550 nm	≤ 18.0 ps/(nm.km)
Chromatic dispersion at 1625 nm	≤ 22.0 ps/(nm.km)
Maximum individual fiber PMD	≤ 0.15 ps/√km
Fiber PMD link value	≤ 0.1 ps/√km
Effective group index of refraction at 1310 nm	1.467
Effective group index of refraction at 1550 nm	1.468
Effective group index of refraction at 1625 nm	1.468
Backscatter coefficient at 1310 nm	-79.2 dB
Backscatter coefficient at 1550 nm	-81.7 dB
Backscatter coefficient at 1625 nm	-82.5 dB
Geometrical Characteristics	
Mode field diameter at 1310 nm	9.2 ± 0.4 µm
Mode field diameter at 1550 nm	10.4 ± 0.5 µm
Core/Cladding concentricity error	≤ 0.5 µm
Cladding diameter	125.0 ± 0.7 µm
Cladding non-circularity	≤ 0.7 %
Primary coating diameter (uncoloured fibre)	242 ±5 µm
Primary coating diameter (coloured fibre)	250 ±10 µm
Fibre curl radius	≥ 4.0 m
Coating-Cladding concentricity	≤ 12 µm
Macrobending loss	
100 turns, mandrel radius 25 mm at 1310 nm	≤ 0.05 dB
100 turns, mandrel radius 25 mm at 1550 nm	≤ 0.05 dB
100 turns, mandrel radius 30 mm at 1625 nm	≤ 0.05 dB
1 turn, mandrel radius 16 mm at 1550 nm	≤ 0.05 dB
Mechanical Characteristics	
Proof test level	≥ 100 kpsi (1.0% strain)
Coating strip force	1.3 ~ 8.9 N
Dynamic fatigue resistance parameter	≥ 20

G.657

Fiber	G.657.A1	G.657.A1 200µm	G.657.A2	G.657.B3
OPK code	A1	200A1	A2	B3
Core	Germanium doped silica			
Cladding	Silica, step index and matched clad type			
Coating	Dual layers of UV-cured acrylate			
Optical Characteristics				
Attenuation coefficient Loose tube Cables (typical / max.) [1,2]				
at 1310 nm	0.32 / 0.36 dB/km			
at 1550 nm	0.19 / 0.24 dB/km			
at 1625 nm	0.22 / 0.26 dB/km			
Attenuation coefficient Tight Buffered Cables (typical / max.) [1,2]				
at 1310 nm	0.35 / 0.40 dB/km			
at 1550 nm	0.25 / 0.40 dB/km			
Attenuation discontinuity [2]	≤ 0.1 dB			
Cable cut-off wavelength [λcc]	≤ 1260 nm			
Zero dispersion wavelength	1302–1324 nm		1300–1324 nm	
Zero dispersion slope [ps/(nm²/km)]	≤ 0.090 ps/(nm.km)	≤ 0.092 ps/(nm.km)		
Chromatic dispersion at 1285 ~ 1330 nm	≤ 3.5 ps/(nm.km)			
Chromatic dispersion at 1550 nm	≤ 18.0 ps/(nm.km)			
Maximum individual fiber PMD	≤ 0.15 ps/√km	≤ 0.1 ps/√km		≤ 0.2 ps/√km
Fiber PMD link value	≤ 0.1 ps/√km	≤ 0.06 ps/√km		≤ 0.1 ps/√km
Effective group index of refraction at 1310 nm	1.467			
Effective group index of refraction at 1550 nm	1.468			
Effective group index of refraction at 1625 nm	1.468			
Backscatter coefficient at 1310 nm	-79.2 dB			
Backscatter coefficient at 1550 nm	-81.7 dB			
Backscatter coefficient at 1625 nm	-82.5 dB			
Geometrical Characteristics				
Mode field diameter at 1310 nm	8.9 ± 0.4 µm		8.6 ± 0.4 µm	
Core/Cladding concentricity error	≤ 0.5 µm			
Cladding diameter	125.0 ± 0.7 µm			
Cladding non-circularity	≤ 0.7 %			
Primary coating diameter (uncoloured fibre)	242 ±5 µm	185 ±10 µm	242 ±5 µm	
Primary coating diameter (coloured fibre)	250 ±10 µm	190 ±10 µm	250 ±10 µm	
Fibre curl radius	≥ 4.0 m			
Coating-Cladding concentricity	≤ 12 µm			
Macrobending loss				
10 turns, mandrel radius 15 mm at 1550 nm	≤ 0.25 dB	≤ 0.25 dB	≤ 0.03 dB	
10 turns, mandrel radius 15 mm at 1625 nm	≤ 1.0 dB	≤ 1.0 dB	≤ 0.1 dB	
1 turn, mandrel radius 5 mm at 1550 nm				≤ 0.15 dB
1 turn, mandrel radius 5 mm at 1625 nm				≤ 0.45 dB
1 turn, mandrel radius 7.5 mm at 1550 nm			≤ 0.5 dB	≤ 0.08 dB
1 turn, mandrel radius 7.5 mm at 1625 nm			≤ 1.0 dB	≤ 0.25 dB
1 turn, mandrel radius 10 mm at 1550 nm	≤ 0.75 dB	≤ 0.75 dB	≤ 0.1 dB	≤ 0.03 dB
1 turn, mandrel radius 10 mm at 1625 nm	≤ 1.5 dB	≤ 1.5 dB	≤ 0.2 dB	≤ 0.1 dB
Mechanical Characteristics				
Proof test level	≥ 100 kpsi (1.0% strain)			
Coating strip force	1.3 ~ 8.9 N	0.5 ~ 8.9 N	1.3 ~ 8.9 N	1.3 ~ 8.9 N
Dynamic fatigue resistance parameter	≥ 20		≥ 20	

NZDSF

Fiber	G.655.D	G.656
OPK code	655	656
Core	Germanium doped Silica	
Cladding	Pure Silica	
Coating	Dual layers of UV-cured acrylate	
Optical Characteristics (Cabled fibre)		
Attenuation coefficient of cabled fibre in Loose tube Cables (Typical / Maximum) [1,2]		
@1550 nm	0.23 / 0.4 dB/km	
@1625 nm	0.26 / 0.4 dB/km	
Attenuation coefficient Tight Buffered Cables (Typical / Maximum) [1,2]		
@1550 nm	0.26 / 0.4 dB/km	
@1625 nm	0.31 / 0.4 dB/km	
Attenuation discontinuity [2]	≤ 0.1 dB	
Cable cut-off wavelength	≤ 1450 nm	
Chromatic dispersion at 1460 ~ 1550 nm	-4.2 – 6,2 ps/(nm·km)	
Chromatic dispersion at 1530 ~ 1565 nm		5.5–10.0 ps/(nm·km)
Chromatic dispersion at 1550 ~ 1625 nm	2.8–11.2 ps/(nm·km)	
Chromatic dispersion at 1565 ~ 1625 nm		7.5–13.5 ps/(nm·km)
Chromatic dispersion at 1530 nm	2.0–5.5 ps/(nm·km)	
Chromatic dispersion at 1565 nm	4.5–6.0 ps/(nm·km)	
Maximum individual fiber PMD	≤ 0.15 ps/√km	
Fiber PMD link value	≤ 0.1 ps/√km	
Geometrical Characteristics		
Mode field diameter @1550 nm	9.6 ± 0.4 µm	9.2 ± 0.5 µm
Core/Cladding concentricity error	≤ 0.5 µm	
Cladding diameter	125.0 ± 0.7 µm	125.0 ± 1.0 µm
Cladding non-circularity	≤ 0.7 %	
Primary coating diameter (uncoloured fibre)	242 ±5 µm	
Primary coating diameter (coloured fibre)	250 ±10 µm	
Fibre curl radius	≥ 4.0 m	
Coating-Cladding concentricity	≤ 12 µm	
Macrobending loss		
100 turns, mandrel radius 30 mm @1550 nm	≤ 0.05 dB	
100 turns, mandrel radius 30 mm @1625 nm	≤ 0.05 dB	
1 turn, mandrel radius 16 mm @1550 nm	≤ 0.5 dB	
1 turn, mandrel radius 16 mm @1625 nm	≤ 0.5 dB	
Mechanical Characteristics		
Proof test level	≥ 100 kpsi (1.0% strain)	
Coating strip force	1.3 ~ 8.9 N	
Dynamic fatigue resistance parameter	≥ 20	

OM1, OM2

Fiber	OM1 62.5/125 µm	OM2 50/125 µm
OPK code	OM1	OM2
Optical Characteristics		
Attenuation coefficient Loose Tube Cables (Typical / Maximum) [1,2]		
at 850 nm	2.6 / 3.5 dB/km	2.2 / 3.5 dB/km
at 1300 nm	0.5 / 1.5 dB/km	0.5 / 1.5 dB/km
Attenuation coefficient Tight Buffered Cables (Typical / Maximum) [1,2]		
at 850 nm	2.6 / 3.5 dB/km	2.5 / 3.5 dB/km
at 1300 nm	0.5 / 1.5 dB/km	0.6 / 1.5 dB/km
Attenuation discontinuity [2]	≤ 0.2 dB	≤ 0.2 dB
Zero dispersion wavelength	1320–1365 nm	1295–1340 nm
Zero dispersion slope 1295 ≤ λ0 ≤ 1310 nm		≤ 0.105 ps/(nm2·km)
Zero dispersion slope 1310 ≤ λ0 ≤ 1340 nm		≤ 0.000375·(1590-λ0) ps/(nm2·km)
Zero dispersion slope 1320 ≤ λ_0 ≤ 1348 nm	≤ 0.11 ps/(nm^2·km)	
Zero dispersion slope 1348 ≤ λ_0 ≤ 1365 nm	≤ 0.001·(1458-λ_0) ps/(nm^2·km)	
Numerical Aperture	0.275 ± 0.015	0.200 ± 0.015
Effective group index of refraction at 850 nm	1.497	1.483
Effective group index of refraction at 1300 nm	1.493	1.478
Performance Characteristics		
Bandwidth (Overfilled launch)		
at 850 nm	≥ 160 – ≥ 250 MHz·km[3]	≥ 500 MHz·km
at 1300 nm	≥ 500 – ≥ 800 MHz·km	≥ 500 MHz·km
Transmission Link Lengths at 1Gb/s		
at 850 nm	≥ 300 – ≥ 500 m[3]	≥ 500 m
at 1300 nm	≥ 550 – ≥ 1000 m	≥ 500 m
Geometrical Characteristics		
Core diameter	62.5 ± 2.5 µm	50 ± 2.5 µm
Core non-circularity	≤ 5.0 %	≤ 5.0 %
Core/Cladding concentricity error	≤ 1 µm	≤ 1.5 µm
Cladding diameter	125.0 ± 1.0 µm	125.0 ± 1.0 µm
Cladding non-circularity	≤ 1.0 %	≤ 1.0 %
Primary coating diameter (uncoloured fibre)	242 ±7 µm	242 ±7 µm
Primary coating diameter (coloured fibre)	250 ±10 µm	250 ±10 µm
Coating-Cladding concentricity	≤ 10 µm	≤ 10 µm
Macrobending loss		
100 turns, mandrel radius 37.5 mm at 850 nm	≤ 0.5 dB	≤ 0.05 dB
100 turns, mandrel radius 37.5 mm at 1300 nm	≤ 0.5 dB	≤ 0.15 dB
2 turns, mandrel radius 15 mm at 850 nm		≤ 0.1 dB
2 turns, mandrel radius 15 mm at 1300 nm		≤ 0.3 dB
2 turns, mandrel radius 7.5 mm at 850 nm		≤ 0.2 dB
2 turns, mandrel radius 7.5 mm at 1300 nm		≤ 0.5 dB
Mechanical Characteristics		
Proof test level	≥ 0.69 GPa (≥ 8.8 N)	
Coating strip force	1.9 N	
Dynamic fatigue resistance parameter	≥ 23	

OM3, OM4, OM5

Fiber	OM3 50/125 µm	OM4 50/125 µm	OM5 50/125 µm
OPK code	OM3	OM4	OM5
Optical Characteristics			
Attenuation coefficient Loose tube Cables (Typical / Maximum) [1,2]			
at 850 nm	2.2 / 3.5 dB/km	2.2 / 3.5 dB/km	2.2 / 3.0 dB/km
at 1300 nm	0.5 / 1.5 dB/km	0.5 / 1.5 dB/km	0.5 / 1.5 dB/km
Attenuation coefficient Tight Buffered Cables (Typical / Maximum) [1,2]			
at 850 nm	2.5 / 3.5 dB/km	2.5 / 3.5 dB/km	2.5 / 3.0 dB/km
at 1300 nm	0.6 / 1.5 dB/km	0.6 / 1.5 dB/km	0.6 / 1.5 dB/km
Attenuation discontinuity [2]	≤ 0.2 dB	≤ 0.2 dB	≤ 0.2 dB
Zero dispersion wavelength	1295–1340 nm	1295–1340 nm	1297–1328 nm
Zero dispersion slope			≤ 4(-103)/(840(1-(λ_0/840)^4)) ps/(nm^2·km)
Zero dispersion slope 1295 ≤ λ_0 ≤ 1310 nm	≤ 0.105 ps/(nm^2·km)		
Zero dispersion slope 1310 ≤ λ_0 ≤ 1340 nm	≤ 0.000375·(1590-λ_0) ps/(nm^2·km)		
Numerical Aperture	0.200 ± 0.015	0.200 ± 0.015	0.200 ± 0.015
Effective group index of refraction at 850 nm	1.483		
Effective group index of refraction at 1300 nm	1.478		
Performance Characteristics			
Bandwidth (Overfilled launch)			
at 850 nm	≥ 1500 MHz·km	≥ 3500 MHz·km	≥ 3500 MHz·km
at 953 nm			≥ 1850 MHz·km
at 1300 nm	≥ 500 MHz·km	≥ 500 MHz·km	≥ 500 MHz·km
Effective Modal Bandwidth (EMB) at 850 nm	≥ 2000 MHz·km	≥ 4700 MHz·km	≥ 4700 MHz·km
Effective Modal Bandwidth (EMB) at 953 nm			≥ 2470 MHz·km
Transmission Link Lengths for 10 Gb/s [4]			
at 850 nm	300 m	550 m [5]	
at 1300 nm	300 m	300 m [5]	
Geometrical Characteristics			
Core diameter	50 ± 2.5 µm		
Core non-circularity	≤ 5.0 %		
Core/Cladding concentricity error	≤ 1 µm		
Cladding diameter	125.0 ± 1.0 µm		
Cladding non-circularity	≤ 1.0 %		
Primary coating diameter (uncoloured fibre)	242 ±7 µm		
Primary coating diameter (coloured fibre)	250 ±10 µm		
Coating-Cladding concentricity	≤ 10 µm		
Macrobending loss			
100 turns, mandrel radius 37.5 mm at 850 nm	≤ 0.05 dB		
100 turns, mandrel radius 37.5 mm at 1300 nm	≤ 0.15 dB		
2 turns, mandrel radius 7.5 mm at 850 nm	≤ 0.2 dB		
2 turns, mandrel radius 7.5 mm at 1300 nm	≤ 0.5 dB		
2 turns, mandrel radius 15 mm at 850 nm	≤ 0.1 dB		
2 turns, mandrel radius 15 mm at 1300 nm	≤ 0.3 dB		
Mechanical Characteristics			
Proof test level	≥ 0.69 GPa (≥ 8.8 N)		
Coating strip force	1.9 N		
Dynamic fatigue resistance parameter	≥ 23		

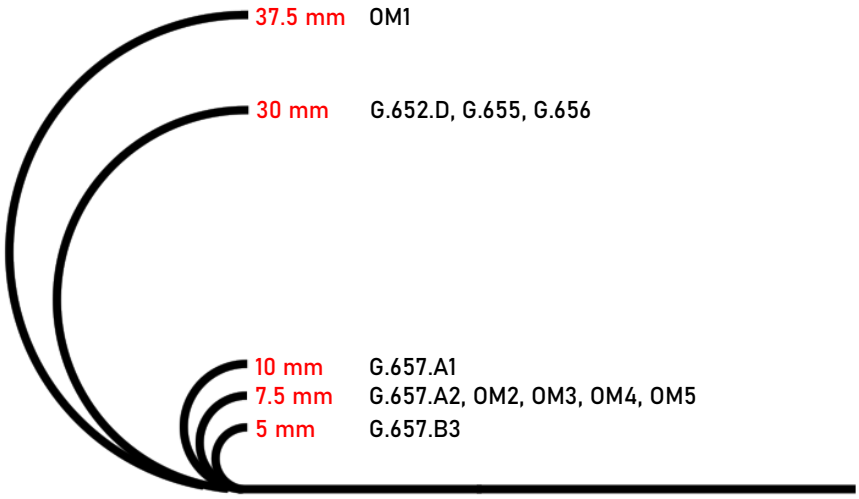
[1] *Unless stated otherwise directly in the cable specification*
[2] *Cabled fibre*
[3] *For both, bandwidth and link lengths special combinations and values are available.*
[4] *850 nm operating wavelength with transmitters meeting encircled flux of ≤ 30 % @ radius 4.5 µm and ≥ 86 % @ radius 19.0 µm.*
[5] *At 1300nm link length using LX4*

- Typical attenuation is the value measured for at least 90% of the fibers in the cable.
- OTDR measurement values can only be guaranteed for cable lengths of 1000 m and more.
- Cable on the reel may show a discontinuity of the OTDR curve caused by winding of the cable on the reel.
- The above values apply, unless otherwise stated directly in the cable specification

Achievable Transmission distance according fibre type

	OM1	OM2	OM3	OM4	OM5	OS2
1 GbE	275 m	550 m	550 m	550 m	550 m	100 km
10 GbE	33 m	82 m	300 m	550 m	550 m	40 km
40 GbE			100 m	150 m	150 m	40 km
100 GbE			70 m	150 m	150 m	10 km
40G-SWDM4			240 m	350 m	440 m	
100G-SWDM4			75 m	100 m	150 m	

Bending radius of optical fibres



OS1a (formerly OS1) vs. OS2 difference

The main difference between the OS1a and OS2 categories is the cable design. The SMF OS1a cable contains fibers in a tight secondary coating (buffer) and are intended mainly for indoor installations. The SMF OS2 cable contains fibers in a loose tube and is designed for outdoor installations for long distances. G.652.A / B / C / D fibers can be used for OS1a category, only G.652.C / D fibers can be used for OS2 cable category.

	OS1	OS1a	OS2
Cable Construction	Tight Buffer	Tight Buffer	Loose Tube
Use	Indoor	Indoor	Outdoor
Fibre standards	G.652.A/B/C/D	G.652.C/D	G.652.C/D
Attenuation at 1310 nm	1.0 dB/km	1.0 dB/km	0.4 dB/km
Attenuation at 1383 nm	Not Specified	1.0 dB/km	0.4 dB/km
Attenuation at 1550 nm	1.0 dB/km	1.0 dB/km	0.4 dB/km

Jacket Material Properties

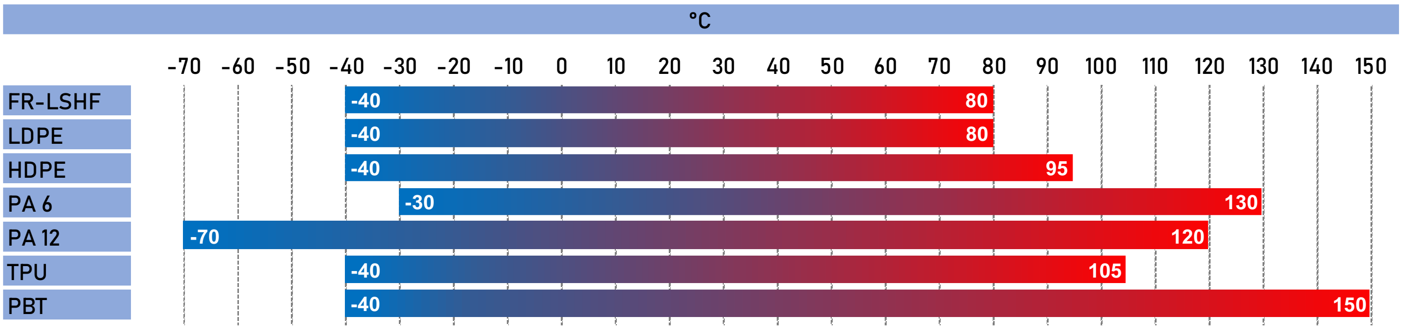
Mechanical properties

	FR-LSHF	LDPE	HDPE	PA 6	PA 12	TPU	PBT
Abrasion resistance	■	■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
Flexibity	■ ■ ■ ■	■ ■ ■	■ ■	■	■	■ ■ ■ ■ ■	■
Hardness	■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■	■	■ ■ ■ ■ ■
Flame retardant ability	■ ■ ■ ■	■ ■ ■	■ ■	■	■	■ ■ ■ ■ ■	■
Flame retardancy	■ ■ ■ ■ ■	■	■	■	■	■ ■	■
Insect/termite	■	■	■ ■	■ ■ ■ ■	■ ■ ■ ■ ■	■	■ ■ ■

Lowest > Highest

■	■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■ ■

Working temperature range



Chemical resistance

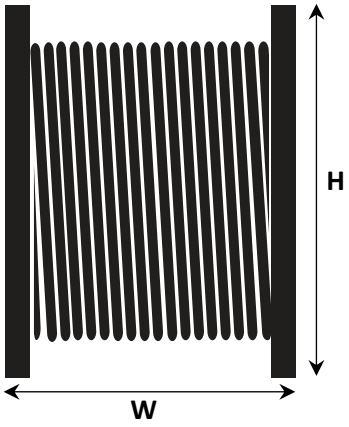
	FR-LSHF		LDPE		HDPE		PA 6		PA 12		TPU		PBT	
	20°C	50°C	20°C	50°C	20°C	50°C	20°C	50°C	20°C	50°C	20°C	50°C	20°C	50°C
Tap Water	■ ■ ■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■	■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■
Salt water	■ ■ ■	■ ■	■ ■ ■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■	■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■
Oils and greases	■ ■ ■	■	■ ■ ■	■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Acid weak (<10%)	■ ■ ■	■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■	■	■ ■ ■	■ ■	■ ■ ■ ■	■ ■	■ ■	■
Acid concentrated	■ ■	■	■ ■	■ ■	■ ■	■	■	■	■ ■	■	■	■	■	■
Kerosene	■ ■	■	■ ■	■	■ ■ ■	■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ *	■	■ ■ ■ ■	■ ■ ■
Gasoline	■	■	■	■	■ ■	■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■	■	■ ■ ■ ■	■ ■ ■
Ozone	■	■	■ ■ ■	■	■ ■ ■	■	■	■	■	■	■ ■ ■ ■	■ ■ ■ ■	■	■
UV	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■	■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Solvent	■ ■	■ ■	■ ■ ■	■	■ ■ ■ ■	■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■	■	■ ■ ■ ■	■ ■ ■

* *After evaporation and reversal of the swelling, the original mechanical properties are almost completely restored.*

■ ■ ■ ■	No damage during of 30 days constant exposure.
■ ■ ■	After 30 days of permanent exposure small damage (reduction of strength and flexibility, colour change, possible change of surface structure)
■ ■	Little or no damage from intermittent short-term exposure
■	Not recommended for continuous use. Immediate damage (swelling, cracking, loss of strength, discolouration or dissolution) may occur.

We emphasize that the data provided here should only be used as a general guide and OPTOKON Kable is not liable for any direct or consequential damages resulting from the use of the data.

Cable drums



	P40	**P**60	**P**75	**P**75max	**P**100	**P**120	**P**140	**S**160
Height (mm)	400	600	755	755	1000	1200	1400	1600
Width (mm)	418	424	420	494	624	624	780	1030
Weight (kg)	4	6	9	12	29	41	47	159

P – *Plywood drum*, **S** – *Solid wooden drum*

Max. cable length (m)								
Cable diameter (mm)	Drum type							
	P40	P60	P75*	P75max	P100	P120	P140	S160
2.0	4100	18100						
3.0	1850	8050	12600	7900				
4.0	1050	4550	7100	4450	11600			
5.0	650	2900	4550	2850	7440	14950		
6.0		2000	3150	1980	5170	10400		
7.0			2300	1450	3800	7640		
8.0				1100	2900	5850		
9.0				880	2290	4600		
10.0				700	1860	3740	7400	9300
11.0				550	1540	3090	6100	7700
12.0					1300	2600	5140	6480
13.0					1100	2200	4300	5520
14.0					950	1900	3780	4750
15.0					820	1660	3290	4150
16.0					720	1460	2890	3640
17.0							2560	3230
18.0							2280	2880
19.0							2050	2580
20.0							1850	2330
21.0							1680	2100
22.0								1900
23.0								1760

**Available only on request for selected cable constructions*

NESC Conditions

Maximum loading of cables by weather (wind, ice, etc.)

Load level	Wind	Ice	Temperature	Added Load (Safety factor)
LIGHT	95 km/h (430 Pa)	0 mm	-1 °C	0.7 N/m
MEDIUM	63 km/h (190 Pa)	6.5 mm	-10 °C	2.5 N/m
HEAVY	63 km/h (190 Pa)	12.5 mm	-20 °C	4.4 N/m

Cable installation by blowing

The combination of the following parameters affects the blowing distance of the optical cable.

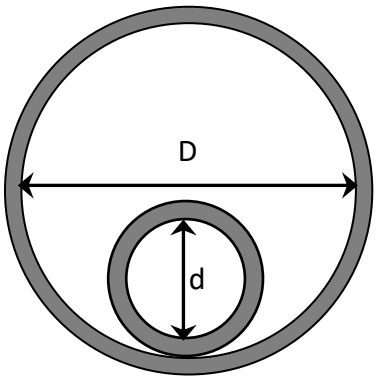
Microduct Fill Ratio (MFR)
Coefficient of Friction (COF)
Cable Stiffness (CAS)

COF - The coefficient of friction is the resistance (friction) generated by the contact between the cable and the inner wall of the tube. The coefficient of friction is influenced by the route profile, the weight of the cable and the type of material of the outer sheath of the cable. The most suitable materials for the cable sheath intended for blowing are PA12, PBT and HDPE. The coefficient of friction can be reduced by using a lubricant or tubes with internal grooves.

MFR - It is the ratio between the cross-sectional area of the cable and the cross-sectional area of the inner diameter of the tube. Ideal values are 35 - 65% (for cables up to diameter 2.0 mm 20 - 65%). If the cables are stiff and the duct is straight, the filling ratio can be up to 80%. The higher filling ratio allows blowing over longer distances, as the cable does not tend to curl inside the tube. In this case, however, the cable has a reduced ability to bend in a tube that is installed with a small bending radius.

$$\text{Filling Ratio Calculation (\%)} \frac{d^2}{D^2} \times 100$$

CAS - The rigidity of the cable depends on the cable construction. The stiffer cable is suitable for longer straight distances and the flexible cable is more suitable for demanding routes with many bends.



d = Cable Outer Diameter
D = Duct Inner Diameter