1. OPTICAL FIBRE CABLES

C - Rail CABLES with 12, 24, 48 or 72 G 652 D
OPTICAL FIBRES
Particular sheet of the cables

2. PARTICULAR SHEET FOR OPTICAL FIBRE

Particular sheet of the optical fibre G 652 D

3. IDENTIFICATION

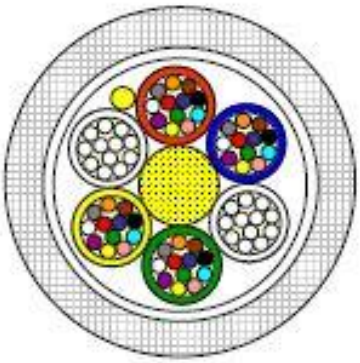
4. GENERAL CONDITIONS

5. TABLE OF TESTS

1. PARTICULAR DATA SHEET

µSHEATH® ACCESS II CABLES with 12, 24, 48 or 72 G 652 D OPTICAL FIBRES

External diameter : **6.0mm**
Weight : **20kg/km**



Example: 48 OF cable

DESIGN

- Dielectric central strength member (FRP)
- Assembly of 12 OF (coloured) jelly filled modules and mechanical modules

Fibre count	12	24	48	72
Number of 12 OF modules	1	2	4	6
Number of mechanical modules	5	4	2	0

- Water tightness between modules and sheath using swell able elements
- Synthetic tape around the assembly
- Ripcord
- Black polyolefin sheath

MECHANICAL CHARACTERISTICS

- BENDING (IEC & EN 60794-1-2 E10 & E11) :
  - Minimum kinking radius : 60 mm*
  - Minimum static bending radius : 120 mm*
- TENSILE PERFORMANCE (IEC & EN 60794-1-2 E1) :
  - Maximum tensile strength during installation (short time)** : 30 daN*
- CRUSH PERFORMANCE (IEC & EN 60794-1-2 E3) :
  - Maximum load : 10 daN/cm*
- IMPACT PERFORMANCE (IEC & EN 60794-1-2 E4) :
  - Maximum energy : 5 N.m (R = 300 mm, no OF break)

TEMPERATURE RANGE

- Storage -30°C/+70°C
- Installation -5°C/+40°C***
- Operating -30°C/+60°C (Da £ 0.1 dB/km @ 1550 nm)

* : Reversible attenuation change
** : Maximum permanent tensile load : 10 daN
*** Between -5°C & +5°C, a previous storage at +2 0 °C during 24 hours is recommended before installation.

ENVIRONMENT

- Water tightness : compliant to IEC 60794-1-2-F5 (3m/24h)

PACKING: 4100 m on D drum.

2. LOW WATER-PEAK G 652 D SINGLEMODE OPTICAL FIBRES

Specifications:

UIT-T G. 652 D
CEI 60793-2-50 type B1.3 series

CABLE REFERENCES: G 652 D

Low water-peak G 652 D single mode optical fibres for wavelength multiplexing (WDM) used by Cable present the following advantages :

- low and optimized attenuation in the 1260 – 1625 nm wavelength range (O, E, S, C and L bands),
- acrylate double coating for long term perenniality of the optical fibres,
- low dispersion and low PMD favourizing the evolution of networks, especially increasing of bit rate transmission (10 Gigabit ETHERNET, ATM, 10 and 40 Gbit/s SONET, SDH, DWDM and CWDM) on long distances,
- compatibility with other existing G 652 A, B and C optical fibres,
- optimized geometrical characteristics for low jointing (splicing) attenuation loss,
- low bending sensivity.

These fibres are recommended for FTTx networks.

Their characteristics are better than thoose required by UIT-T G 652 D specifications (see table below).

Attenuation			
Attenuation @ 1310 nm			≤ 0.35 dB/km *≤
Attenuation between 1285 and 1330 nm			≤ 0.38 dB/km *
Attenuation @ 1550 nm			≤ 0.21 dB/km *
Attenuation between 1530 and 1570 nm			≤ 0.24 dB/km *
Attenuation @ 1625 nm			≤ 0.24 dB/km *
Attenuation @ 1383 nm			≤ 0.34 dB/km
Attenuation slope regularity @ 1310 and 1550 nm			Local discontinuity ≤ 0.1 dB
Bending sensivity			
Bending loss	Bending diameter, mm	Number of turns	Attenuation
	32	1	≤ 0.5dB @ 1550 nm
	60	100	≤ 0.05dB @ 1550 nm
PMD			
Polarization mode dispersion (PMD) – bare fibre			≤ 0.1 ps/km1/2
Polarization mode dispersion (PMD) – fibre in cable			≤ 0.2 ps/km1/2
Dispersion			
Chromatic dispersion @ 1310 nm			≤ 3.5 ps/nm²/km
Chromatic dispersion @ 1550 nm			≤ 18.0 ps/nm²/km
Zero dispersion wavelength			1312 +/- 12 nm
Zero dispersion slope @ 1550 nm			≤ 0.092 ps/nm²/km
Cut off wavelength			
Cut off wavelength (in cable)			≤ 1260 nm
Mode field diameter			
Mode field diameter @ 1310 nm			9.1 +/- 0.5 µm
Mode field diameter @ 1550 nm			10.4 +/- 1µm
Geometrical characteristics			
Cladding diameter			125.0 +/- 1 µm
Cladding non circularity			≤ 1 %
Core/cladding concentricity error			≤ 1 %
Fibre curl			≤ 0.6 µm
Coating diameter			≥ 4 m
Coating concentricity error			245 +/- 5 µm
Coating concentricity error			≤ 12 µm

* : typical value in cable

2. LOW WATER-PEAK G 652 D SINGLEMODE OPTICAL FIBRES

Mechanical characteristics	
of test (elongation = 1 %)	≥ 0.7 GN/m²
Coating stripping force	1.2 up to 3.0 N
Influence of environment	
Attenuation change between –60 and +85 °C	≤ 0.05 dB/km @ 1310 & 1550 nm
Attenuation change between –10 et +85 °C with 98 % relative humidity	≤ 0.05 dB/km @ 1310 & 1550 nm
Attenuation change in water @ +23 +/- 2 °C	≤ 0.05 dB/km @ 1310 & 1550 nm
Attenuation change after ageing @ +85 +/- 2 °C	≤ 0.05 dB/km @ 1310 & 1550 nm
Typical values	
Refractive index @ 1310 nm	1,4677
Refractive index @ 1550 nm	1,4682
Dynamic fatigue parameter (nd)	20

3. IDENTIFICATION

1. MARKING

Hot foil marking every meter on cable outer sheath. :
Week - Year - Number of fibres - Type of fibres – Manufacturer + metric marking (other identification
marking possible : to be indicated by the customer).

2. IDENTIFICATION

Fibre colour code :

1 red, 2 blue, 3 green, 4 yellow, 5 violet, 6 white/natural, 7 orange, 8 grey, 9 brown, 10 black, 11 aquamarine, 12 pink.

Module colour code :

1 red, 2 blue, 3 green, 4 yellow, 5 violet, 6 white/natural

Filler colour code :

All fillers are white.

3. DRUM IDENTIFICATION

The following information are included on a plate or label fixed on the drum:
- Cable description,
- Cable code,
- Length and weight of drum,
- Drum number,
- Order number,
- Year of manufacture,

4. DELIVERY CONDITIONS

1. CABLE LENGTH

Standard delivery lengths: L ± 3 % (value of L : refer to cable particular sheet)

Provisions for irregular lengths:

- up to 10% of the total order length (with a minimum of one L length) may be split in two equal L/2 lengths
- up to 10% of the total order length (with a minimum of one length) may be delivered in irregular lengths ≥1000m

2. SEALING OF ENDS

Each cable end is sealed with an heat-shrinkable cap.

5. TABLE OF TESTS

1. ROUTINE TESTS

We propose routine tests according to the following table.

Tests	Reference	Sampling	
		SILEC CABLE	Acceptance (*)
Dimensional	IEC 60811-1-1		
- outer diameter		1 cable (a)	1 cable
- thickness of the sheath		"	"
- identification		"	"
Optical and transmission			
- attenuation (1) in the	IEC 60793-1-40-C	100%	10 % of cable
specified window(s)	back-scattering		(10 % of OF)
- regularity of attenuation	Method	100%	"
at 1550 nm (SM) or 850 nm (MM)			
Mechanical on the outer sheath			
- tensile strength	IEC 60811-1-	1 cable (b)	1 cable
- elongation at break	EN 50290-2-24 (PE)	"	"
Environment			
- water penetration (2)	IEC 60794.1.2-F5B	1 cable (c)	1 cable

(*) Each cable end is sealed with an heat-shrinkable cap.

Nota:

(a) : 1 test/design of cable / week
(b) : 1 test per period/ type of outer sheath/ manufacture line / Period = 1 month if PE sheath
(c) : 1 test/design of cable /month

(1) attenuation :
Backscattering measurements performed from one cable end (1.55 µm for SM OF / 0.85/1.3 µm for MM OF) + optical continuity for all fibres.
In case of limit values, the measurement will perform from both ends and the attenuation is the average of the both values. In case of doubt, the attenuation will be determined by the cut-back reference method (IEC 60793-1-40-A).
Attenuation value is significant only for cable length ≥ 1 km
For cable length < 1km, only the regularity of transmission at 1550 nm (SM) or 850 nm (MM) will be controlled.

(2) Water penetration test
Applicable to the whole cable or only to watertight parts, according to cable design and specifications.
Conditions : sample length : 3 meters; water height: 1 m; duration: 24 hours

5. TABLE OF TESTS

2. TYPE TESTS (not included in cable´s price) :

We perform ISO 9001 certified Quality Assurance system and internal test procedures ensuring that the cables supplied meet the requirements of customer.

In this framework, type tests are carried out when initially designing/developing the given cable type, and are not intended to be repeated on every order or manufactured cable length.
However, on customer's request, the renewal of some type tests may be considered as part of the order acceptance program, providing an agreement has been reached between the customer and Manufacturer at the time of ordering, including, if any, the specific conditions applicable to the implementation of the tests.
Alternatively, certificates of conformity or test reports, relating to previous supplies and/or qualification programs of same or similar cable type, can be provided as part of the technical documentation pertaining to the order.

For information, the following table shows the main type tests relevant to the proposed type of cable and supporting the characteristics stated in the cable particular data sheet.

Type of tests	Reference IEC 60794.1.2 EN 60794.1.2	Sampling
- tensile	E1	1 cable
- crush	E3	1 cable
- impact	E4	1 cable
- Repeated bending	E6	1 cable
- Torsion	E7	1 cable
- kink	E10	1 cable
- bend	E11	1 cable
-Temperature cycling	F1	1 cable

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