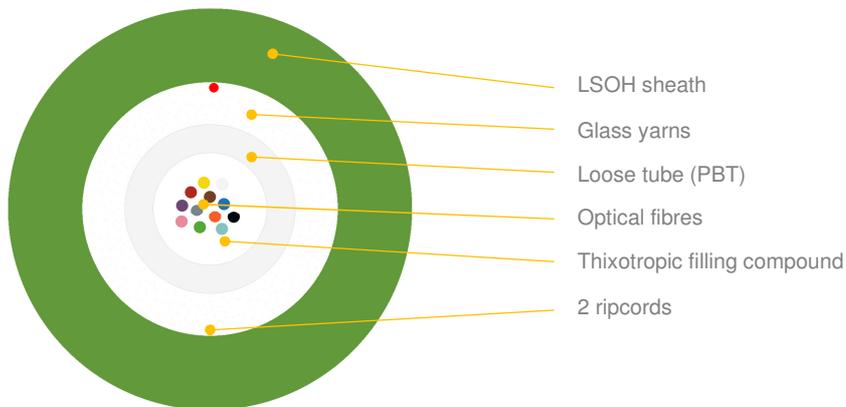


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## 12F Mono Tube Cable



\*schematic drawing, not to scale

### DESIGN:

Central loose tubes (PBT Ø 3.0mm) with thixotropic filling compound and ITU-T G.652D optical fibres  
Glass yarns as strain relief and water absorbent  
Red polyester ripcords (2)  
UV stabilized green (RAL 6018) LSOH sheath (minimal thickness 1,3mm)

Variant	Quantity [pcs]				Ø nominal (-0,3/+0,3) [mm]	Nominal weight (±10%) [kg/km]	Max allowed tension [N] / ε=0,4%	Max static tension [N] / ε=0,25%
	Fibres	Fibres per tube	Total elements	Active tubes				
1T x 12F	12	12	1	1	7,1	54	2000	1000

### FIBRES COLOUR CODE

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

### TUBES COLOUR CODE

Central tube: natural

### OPTICAL FIBRES AND LOOSE TUBES COLOUR IDENTIFICATION

Fibres and tubes identification information see **DSH\_Colors\_CODE\_XXXX** document.

### FIBRES PARAMETERS

Optical fibres parameters see **DSH\_OFP** document.

### MECHANICAL AND ENVIRONMENTAL CHARACTERISTICS

Temperature range:

Installation: -10... +50 [°C]  
Operation: -20... +60 [°C]  
Transport & Storage: -40... +70 [°C]

Cable bending radius:

12 x cable diameter (during operation)  
20 x cable diameter (during installation)

Test	Specification	Method	Requirements
Tensile strength	IEC60794-1-21 Method E1	<b>Mandrel diameter:</b> $\geq 30 \times \text{OD}$ <b>Sustained load:</b> 1000N / 15 min <b>Sample Length:</b> 100 m <i>All fibres to be spliced</i>	<b>Fibre strain:</b> < 0.25%(during test) $\leq 0.05\%$ (after test) <b>Attenuation increment:</b> $\Delta\alpha \leq 0.05\text{dB @ } 1550\text{nm}$ (after test) No significant damage to fibre unit
		<b>Mandrel diameter:</b> $\geq 30 \times \text{OD}$ <b>Extended load:</b> 2000N or $\epsilon=0.4\%$ / 15 min <b>Sample Length:</b> 100 m <i>All fibres to be spliced</i>	<b>Fibre strain:</b> < 0.4%(during test) $\leq 0.05\%$ (after test) <b>Attenuation increment:</b> $\Delta\alpha \leq 0.05\text{dB @ } 1550\text{nm}$ (after test) No significant damage to fibre unit
Crush resistance	IEC60794-1-21 Method E3	<b>Load:</b> 1600 N / 10 cm / 5 minutes <b>Plate size:</b> 100 mm x 100mm <b>Number of pts:</b> 3 (500mm apart) <i>All fibres to be monitored</i>	$\Delta\alpha \leq 0.1\text{dB @ } 1550\text{nm}$ (after test) No jacket cracking and fibre breakage
Impact resistance	IEC60794-1-21 Method E4	<b>Impact energy:</b> 10J <b>Radius:</b> 300 mm <b>Distance:</b> 0.5m <b>No. of impacts:</b> 3 at different points 500mm apart <i>All fibres to be monitored</i>	$\Delta\alpha \leq 0.1\text{dB @ } 1550\text{nm}$ (after test) No jacket cracking and fibre breakage
Torsion	IEC60794-1-21 Method E7	<b>Cable length to be twisted:</b> 2m <b>No. of cycles:</b> 5 <b>Twist angle:</b> starting position to $-180^\circ$ to starting position to $+180^\circ$ , and back ( $\pm 360^\circ$ total) <b>Load:</b> 100N <i>All fibres to be monitored</i>	$\Delta\alpha \leq 0.1\text{dB @ } 1550\text{nm}$ (after test) No jacket cracking and fibre breakage
Bending	IEC60794-1-21 Method E11	<b>Mandrel radius:</b> $12 \times \text{OD}$ / 5 turns (wrapped and unwrapped) / 3 flexing cycles <i>All fibres to be monitored</i>	$\Delta\alpha \leq 0.1\text{dB @ } 1550\text{nm}$ (after test) No jacket cracking and fibre breakage
Abrasion resistance	IEC60794-1-21 Method E2B (Method 1)	<b>No. of cycles:</b> 200 <b>Load:</b> 4N (LSOH sheath)	Legend shall remain legible
Water penetration	IEC 60794-1-22 Method F5A, F5B	<b>Water head:</b> 1m <b>Sample length:</b> 1m (3 samples of each cable) <b>Time:</b> 24 hrs	No water leakage
Tube kink	IEC 60794-1-21 Method G7	<b>Length(L1):</b> 350mm <b>Moving length:</b> 100mm/60mm <b>Number of cycles:</b> 5 <b>Number of samples:</b> 5	No tube kink
Ripcord test	IEC 60794-1-21 Method E25	Keeping the test samples 12h @ $-10^\circ\text{C}$ 400mm of the cable sample should be ripped through and the cable core revealed. <b>No. of samples:</b> 3	The rip cord shall rip through the cable sheath and not break for the entirety of the pull
Temperature cycling	IEC 60794-1-22 Method F1	Temperature steps: <b>1 cycle</b> $+23^\circ\text{C} \rightarrow 10^\circ\text{C}(T_{A1}) \rightarrow +60^\circ\text{C}(T_{B1}) \rightarrow +23^\circ\text{C}$ <b>2 cycle (last cycle)</b> $+23^\circ\text{C} \rightarrow 10^\circ\text{C}(T_{A1}) \rightarrow -40^\circ\text{C}(T_{A2}) \rightarrow +60^\circ\text{C}(T_{B1}) \rightarrow +70^\circ\text{C}(T_{B2}) \rightarrow +23^\circ\text{C}$ <b>Step time:</b> 8h	For $T_{A2}$ and $T_{B2} \leq 0,15\text{dB/km}$ For $T_{A1}$ and $T_{B1} \leq 0,05\text{dB/km}$ Test wavelength: 1550nm
Flame retardant	IEC 60332 -1	<b>Sample:</b> 600mm / <b>time :</b> 60s	Uncharred surface length: min. 50mm; Shall meet specification
Smoke density	IEC 61034-2	<b>Chamber:</b> $27\text{m}^3$ <b>Test duration:</b> 40 min	Light transmittance: min. 50%
Toxicity	IEC 60754-2	<b>Temp.:</b> $935^\circ\text{C}$ / <b>time:</b> 30 minutes	PH $\geq 4.3$ Conductivity $\leq 10\mu\text{s/mm}$

## MARKING

The following print (white hot foil / inkjet) is applied at 1-meter intervals:

"MANUFACTURER'S NAME" "NUMBER OF OPTICAL FIBRES" "FIBRE TYPE" "YEAR/MONTH" "CUSTOMER" "LASER SYMBOL" "LENGTH MARKING" "BATCH NUMBER"

**Example:** FIBRAIN EXOVM-12 12F SM G652D 2015/06 PROPERTY OF VIRGIN MEDIA "LASER SYMBOL" "LENGTH MARKING" "BATCH NUMBER"

The accuracy of marking is  $\pm 0,5\%$ . Remarking is in accordance with Bellcore GR 20 and supersedes earlier markings. Occasional loss of marking is possible. Cables can be supplied with a range of single mode or multimode fibres and customized print.

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#### PACKING

Cables will be shipped on disposable wooden or treated wooden drums. Both ends of the cable will be capped and accessible for testing. Rotation direction arrow will be marked on the drum together with identification information.

#### DELIVERY LENGTH

2000 – 8000 meters +1% / -2%, with possibility of supplying up to 5% of total contract quantity as short length cables which should be above 1000 meters long. Tolerance of 5 % of order quantity shall be allowed.

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