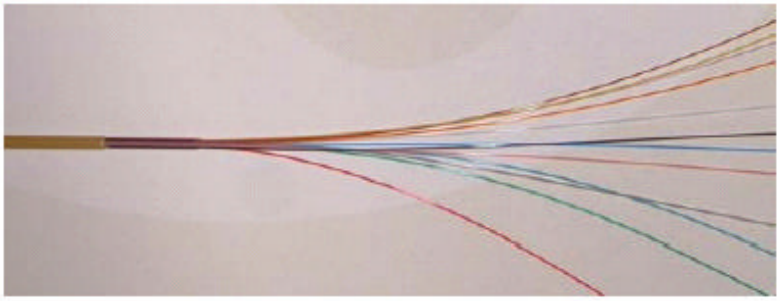
Fibre Specification

DESIGNATION: MHT 1200 2 to 12 fibre units

Date: 20/9/03



## PRODUCT DESCRIPTION:

Various G652 single mode fibres to specification MHT 1400, set in a buffer layer providing excellent dimensional and thermal stability. The outer thermoplastic layer provides a high level of protection and excellent installation properties. The units are designed for blowing into MicroDucts and tube bundles. The fibres are dry, not coated with gel, thus permitting fast and contamination-free connections.

## COMMON DATA (all fibre counts):

Bend Radius: See table below.
Keep FU in supplied containers until deployment. NB: The MBR of deployed fibre units requires that they are stored as circular coils, or deployed inside Lite Access-approved carrier tube, or tube with fibre inside can be wound around a smooth former of suitable material and diameter.

| Temperatures: | | |
|---|---|---|
| | Storage: | -20°C to +70°C |
| | Installation: | -5°C to +50°C |
| | Lifetime: | -20°C to +50°C |

COMMON DATA (all fibre counts):

Fibre colours: blue, orange, green, red, grey, yellow, brown, violet, black, aqua, pink, white.

Breakout: 1. Remove sheath with Lite Access tool #7299 using a rotary motion. 2. Gently crush the end to separate fibres. 3. Pull apart the fibres in groups. This finally leaves 12 loose fibres that require no cleaning with solvent. 4. Use Miller strippers (LA #7335) to strip fibres.
Document MHT 1337 describes this process in more detail.

| **INDIVIDUAL PROPERTIES** | **2 fibre unit** | **4 fibre unit** | **8 fibre unit** | **12 fibre unit** |
|---|---|---|---|---|
| Outer diameter (nom) | 1.1 mm | 1.1 mm | 1.5 mm | 1.6 mm |
| Mass 'w' (nominal) g/m = kg/km | 1.0 g/m | 1.0 g/m | 1.8 g/m | 2.2 g/m |
| Min bend radius (MBR) when deployed | 50 mm | 50 mm | 80 mm | 80 mm |
| Fibre Colours (see sequence above) | blue, orange | 1st 4 colours | 1st 8 colours | All 12 colours |

## Optical Parameters (Fibre Unit)

Fibre type: Single mode to G652 (ITU-T) and MHT 1400
Attenuation typical: .4dB/km max at 1310nm (at room temp)
0.3dB/km max at 1550nm (at room temp)
PMD: Data to be advised

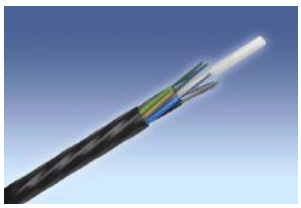
Mechanical Performance (all optical measurements at 1550 nm)

| Test | Test Method | Test Parameters | Requirements |
|---|---|---|---|
| Tensile Performance | (EN 187000 A1/501 IEC 794-1-E1 Change @ 1550nm | Load is 1x w (in kg) (eg 12fu is 2.2kg) 10 min | Fibre strain ≤0.4% at max force Attenuation increment ≤0.05dB and fibre strain ≤0.05% after test |
| Flexing | IEC 60794-1-2-E11A Change @ 1550nm | Diam 40mm x 3 turns 5 cycles at 20ºC | Attenuation ≤0.05dB increment after test |
| Crush I | IEC 60794-1-2-E3 Change @ 1550nm | 100 mm plate, 100N, 1 min, 2 tests at different places | ≤0.05%dB increment after test |
| Crush II | IEC 60794-1-2-E3 Change @ 1550nm | 100 mm plate, 500N, 1 min, 2 tests at different places | No fibres broken |

| Test | Test Method | Test Parameters | Requirements |
|---|---|---|---|
| Temperature Cycle | IEC 6-794-1-2-F1 (3 cycles) | +20ºC, -40ºC, +60ºC | Absolute attenuation during test to be ≤0.5dB/km (1550nm and 1310nm) ≤0.1dB/km change during and after test compared to start value |
| Water Soak | BT spec CW 1574 | 2000 hours in distilled water, 18ºC/22ºC | (Test after temp cycle) ≤0,07dB/km change compared to start value. (1550nm) |
| Damp Heat Cycle | IEC 60068-2-38 (10 cycles) | 25ºC, 65ºC, 25ºC, 65ºC, 25ºC, -10ºC, 25ºC | Absolute attenuation during test to be ≤0.5dB/km (1550 and 1310nm) ≤0.1dB/km change during and after test compared to start value. |

Blown Mini Cable G652d

Fibre counts 12 to 144



## Product Description

Mini cable containing single mode optical fibres designed for installation into microduct by blowing. Loose Tube Mini-cable, non-metallic, longitudinal water-protected, outer diameters 6.1mm (maximum 72 fibres), 6.6mm (maximum 96 fibres) and 7.9mm (maximum 144 fibres). Fibre type meets ITU-T G652D.

## Application

Optical mini cables for installation into blown fibre microducts.

## Technical Data

| | | |
|---|---|---|
| Stranding: | Loose tubes and fillers, SZ stranded | |
| Water Blocking | Dry core with water swellable elements. Gel-filled loose tube. | |
| Minimum Bend Radius: | During installation | 20 x outside diameter |
| | During operation | 10 x outside diameter |
| Temperatures: | Storage/Transport: | -40°C to +65°C |
| | Operating: | -40°C to +65°C |

## FIBRE AND TUBE IDENTIFICATION

Fibres are identified using 12 different colours according to TIA/EIA-598
Tube colours are Red (1st tube), Green (2nd tube) White (remaining tubes).

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

Fillers: natural
144f: Each tube contains 2 bundles of 12 fibres, wrapped with a yarn for identification

## SHEATH MARKING EVERY (every 1m)

Product Code – Year – Fibre Type – Count – Meter Mark

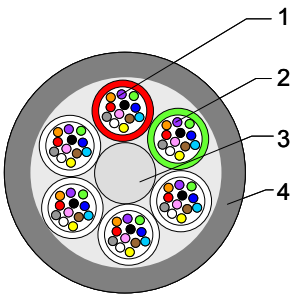
## OPTICAL PARAMETERS (Cabled)

| | |
|---|---|
| Fibre type: | Single mode to G652d (ITU-T ) |
| Attenuation: | 0.35 dB/km max at 1310nm (at 20°) |
| | 0.22 dB/km max at 1550nm (at 20°) |
| Waterpeak | 0.35 dB/km max at 1383nm (at 20°) |

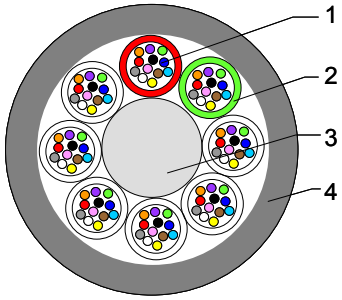
**PROPERTIES**

Design (drawing not to scale)
1. Coloured optical fibre 2. Gel filled loose tube 3. Strength element 4. Low friction sheath

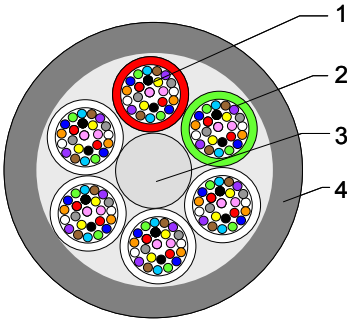
6 Tubes of 12




8 Tubes of 12




6 Tubes of 24

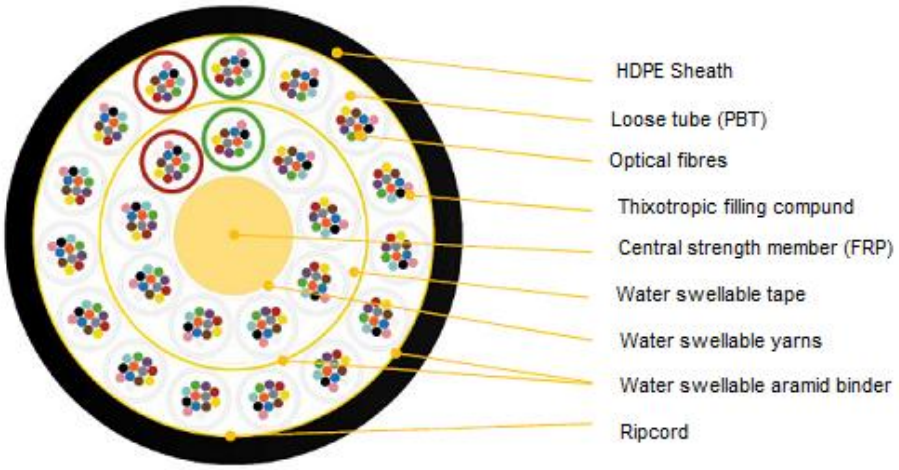



| Maximum Fibre Count | | 24 to 72 | 96 | 144 |
|---|---|---|---|---|
| Design | | 6 tubes of 12<br>Fillers where necessary | 8 tubes of 12 | 6 tubes of 24 |
| Outer diameter (nominal) | mm | 6.1 | 6.6 | 7.9 |
| Mass (nominal) | Kg/km | 30 | 33 | 43 |
| Max Tensile (Operation) | N | 300 | 200 | 300 |
| Max Tensile (Installation) | N | 350 | 200 | 300 |
| Crush Strength | N | 1000 | 800 | 1000 |
| Minimum bend radius | mm | 130 | 130 | 160 |
| Minimum microduct bore | mm | 8 | 10 | 10 |

**MECHANICAL PERFORMANCE**

| **Test** | **Test Specification** | **Test Method** | **Specification** |
|---|---|---|---|
| Tensile Test | IEC 60794–1–2-E1 | For tensile load, see Properties table. | Attenuation change:<br>≤ 0.05dB at 1550nm<br>During and after the test, no damage |
| Crush | IEC 60794–1–2-E3 | For crush load, see Properties table | Attenuation change:<br>≤ 0.05dB at 1550nm<br>During and after the test, no damage |
| Impact | IEC 60794–1–2-E4 | 3 impact points of 1J, R= 12.4 mm<br>(300mm for 6 tubes of 12 design)<br>(3J for 6 tubes of 24 design) | Attenuation change:<br>≤ 0.05dB at 1550nm, after the test |
| Cable Bend | IEC 60794–1–2-E11 | R=20x D, 4 turns, 10 cycles | Attenuation change:<br>≤ 0.05dB at 1550nm<br>During and after the test, no damage |
| Temperature Cycling | IEC 60794–1–2-F1 | Temperature step<br>+20ºC → - 40ºC →+65ºC → + 20ºC | Attenuation change:<br>≤ 0.05dB at 1550nm<br>During and after the test, no damage |
| Water Penetration | IEC 60794–1–2-F5 | Sample 3m<br>1m water column, 24h | No water leakage |

# DESIGNATION: MK-LXS11 Loose Tube 288F SM Mini-cable




*schematic drawing, not to scale

**DESIGN:**

FRP strength and anti-buckling element
Dry yarns to prevent moisture ingress into the cable
SZ stranded cable core
Loose tubes (PBT Ø 1,4mm) with thixotropic filing compound and ITU-T G.652D optical fibres
PBT fillers (loose tubes with mechanical fibre - when applicable)
Water-swellable aramid binder
Polyester ripcord
UV stabilized black HDPEsheath

| Variant | Quantity [pcs] | | | | Ø nominal (±3%) | Nominal weight (±5%) | Max allowed tension | Max static tension |
|---|---|---|---|---|---|---|---|---|
| | Fibres | Fibres per tube | Total elements | Active tubes | [mm] | [kg/km] | [N] / ε=0,33% | [N] / ε=0,05% |
| 24T x 12F | 288 | 12 | 24 | 24 | 9,4 | 72 | 1000 | 250 |

**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: | -5… +50 [°C] |
| Operation: | -10… +70 [°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 | **Sustained load**: 250N | $\Delta\varepsilon_f$ = 0.05%<br>$\Delta\alpha \leq$ 0.05dB @ 1550nm (after test)<br>No significant damage to fibre unit |
| | | **Extended load**: 1000N or $\Delta\varepsilon_f$ =0.33% | $\Delta\varepsilon_f <$ 0.33%(during test)<br>$\Delta\varepsilon_f \leq$ 0.05%(after test)<br>$\Delta\alpha \leq$ 0.05dB @ 1550nm (after test)<br>No significant damage to fibre unit |
| Crush resistance | IEC60794-1-21 Method E3 | **Load:** 500 N / 10 cm | $\Delta\alpha \leq$ 0.1dB @ 1550nm (after test)<br>No jacket cracking and fibre breakage |
| Impact resistance | IEC60794-1-21 Method E4 | **Impact energy**: 2J | $\Delta\alpha \leq$ 0.1dB @ 1550nm (after test)<br>No jacket cracking and fibre breakage |
| Torsion | IEC60794-1-21 Method E7 | **Cable length to be twisted:** 2m<br>**No. of cycles:** 10<br>**Twist angle:** ±180° | $\Delta\alpha \leq$ 0.1dB @ 1550nm (after test)<br>No jacket cracking and fibre breakage |
| Bending | IEC60794-1-21 Method E11 | **Mandrel radius**: 20 x OD / 4 turns / 3 cycles | $\Delta\alpha \leq$ 0.1dB @ 1550nm (after test)<br>No jacket cracking and fibre breakage |
| Repeated bending | IEC60794-1-21 Method E6 | **Sheave Radius:** 20 x OD | $\Delta\alpha \leq$ 0.1dB @ 1550nm (after test)<br>No jacket cracking and fibre breakage |
| Water penetration | IEC 60794-1-22<br>Method F5B | **Water head**: 1m<br>**Sample length**: 3m<br>**Time**: 24 hrs | No water leakage |

## MARKING

The following print (white / ink jet) is applied at 1-meter intervals:

**Example:** LITE ACCESS 288F SM G652D 24T12F "YEAR OF MANUFACTURE" "LASER SYMBOL" "LENGTH MARKING" "BATCH NUMBER"

The accuracy of marking is ±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.

## 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 ± 5%, 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.