

## Cable properties according to the data sheet and in reality

Data sheets that quote IEC / DIN EN standards give the impression of high reliability

### Case 1:

A comparison between information according to the manufacturer's data sheet and the test results of "Tensile performance and cable bending under tension" (operational and installation conditions, under tension, with fixed S-shaped deflecting bends

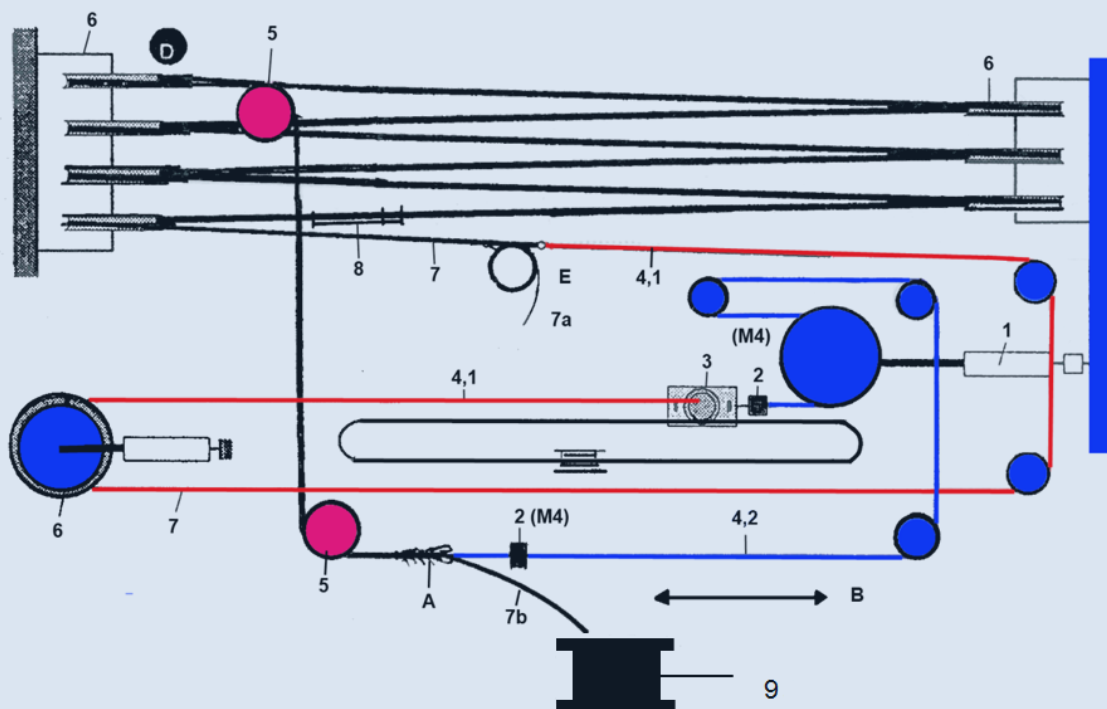
**Standard requirement: Optical external cables DIN EN 60794-3 (VDE 0888 Part 108)**

**Mechanical properties according to the manufacturer:**

Max. number of fibres			up to 48
Outer diameter	[mm]		11,0 ± 0,5
Weight	[kg/km]		84
Min. bending radius	[mm]	Without tension	15 x D
		With tension	20 x D
Max. tensile strength	[N]	After installation	5000
		For a short period	6000
Max. lateral pressure	[N]	After installation	2000
		For a short period	

## Fibre Optics CT test setup – combination test over fixed S-shaped pipes

- **Cable tensile strength DIN EN 60794-1-2**
  - Attenuation change, Method E1A
  - Fibre elongation, Method E1B
  - Cable elongation, Method without standard
- **Cable bending under tension DIN EN 60794-1-2 / E18**
  - Attenuation change



- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1 Tensile force transducer</li> <li>2 DMS tensile force measuring device with a tolerance of &lt;3%</li> <li>3 Dynamic pulling device with max. permissible load on optical cable/speed <math>V = &lt; 10</math> m/min from A <math>\leftrightarrow</math> B</li> <li>4 Auxiliary rope</li> <li>5 Cable/deflecting radius as per data sheet</li> </ul> | <ul style="list-style-type: none"> <li>6 Cable deflecting rollers <math>\varnothing 600</math> mm</li> <li>7a Cable sample, length &gt; 50/100 m. with pulling grip at both ends</li> <li>7b Fibre immobilised at pulling end</li> <li>7c Fibre immobilised at holding end</li> <li>8 Measurement of cable elongation</li> <li>9 Cable spool elongation)</li> <li>M4 PC data collection (OTDR, tension, cable elongation)</li> </ul> |
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## Overview of test results

### Cable tensile strength acc. to DIN IEC 60794-1-2/ E1A Static test of long-term tensile load $T_0$

Tensile strength: specified value  $\leq 6000$  N    nominal value  $\leq 5000$  N  
Attenuation change: specified value  $\leq 0.05$  dB    nominal value  $\leq$   
Cable elongation: specified value  $\leq 0.7\%$  <sup>(2)</sup>    nominal value  $\leq$



### Cable bending under tension in acc. with DIN IEC 606794-1-2/ E18A Dynamic test

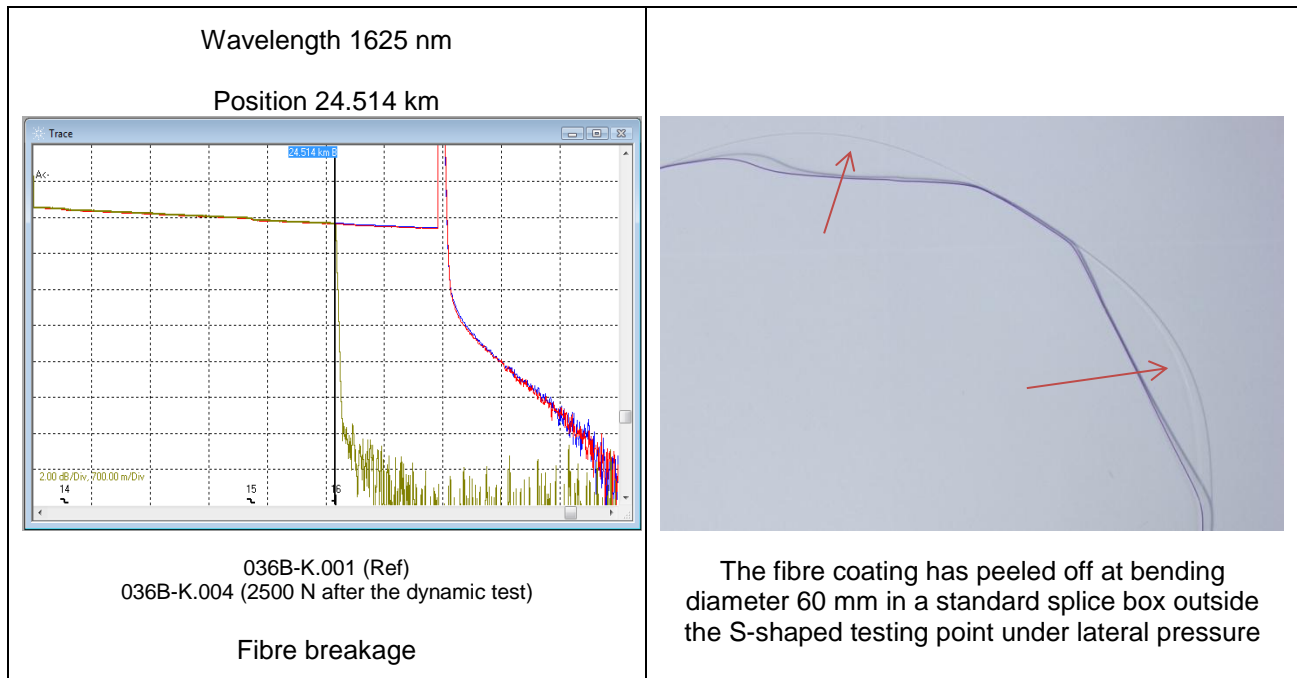
Tensile strength: specified value  $\leq 6000$  N    nominal value 2800 N  
Attenuation: specified value  $\leq 0.05$  dB <sup>(1)</sup>    nominal value  $\leq$  fibre breakage



(1) Specified values acc. to DIN EN 60794-3 (2002) and 60794-3-10 (2002) during and after the tensile strength test  
(2) At highest permissible tensile strength

## Test results

### Cable bending under tension DIN EN 60794-1-2 / E18



## Causes of failure

### Cable manufacturer

- Faults connected with design or technical production processes, inadequate quality management
- The cable property information on the data sheet and the minimal standard requirements acc.to DIN EN 60793-3-10 Abs. 4.6.1, 60794-3 and 60794-3-12 have not (never?) been checked in the place of production!

e.g. fibre elongation, fibre length, sheath elongation under tensile stress

Causes: loose tube materials, stranding properties and extreme deviation from the cabled fibre excess length 61%, FO guideline  $\leq 0,1 \%$

Results of repeated test with respect to installation faults, [see case 2]

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