fibre optics
CT Consulting & Testing GmbH

News 00/02.2

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 2:
Fault analysis of Case 1 fibre breakage:
Is the installation process or the manufacturer to blame?

- Test results for tensile strength, cable bending under tension and lateral pressure after pragmatic testing under installation conditions over S-shaped corner rollers for underground cables
- Standard requirements for external optical cables acc. to DIN EN 60794-3 and 60794-3-10 (2002)

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 With tension	15 x D 20 x D
Max. tensile strength	[N]	After installation For a short period	5000 6000
Max. lateral pressure	[N]	After installation For a short period	2000

Fibre Optics CT test setup – combination test over fixed corner rollers for underground cables

- **Cable tensile strength DIN EN 60794-1-2/E1A**
- Attenuation change, Method E1A
- Cable elongation, Method without standard

- **Cable bending under tension DIN EN 60794-1-2 / E18A**
- Attenuation change
- Lateral pressure, static and dynamic,over underground cable corner rollers

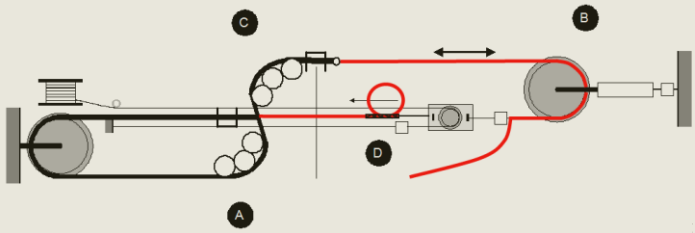
Short description of test

Individual testsd

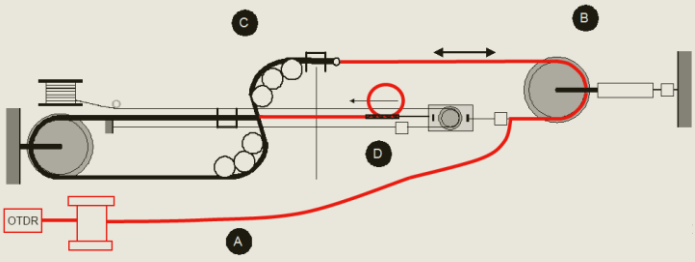
1st tst cycle:	Stretching behaviour of central element/ cable in a straight line from D (approx. 5 m)
2nd test cycle:	Mechanical performance of cable (approx. 5 m are pulled at F_{max} in an S-shape from B to A through the smallest permissible deflection radius, then back from A to B)
3rd & 4th test cycle:	Stretching behaviour of central element/ cable in a straight line from D at limit load (approx. 5 m)

Test setup1: 27 m sample length / ~ 7 m of it under dynamic tensile stress

1st/ 3rd & 4th test cycles
“static test”

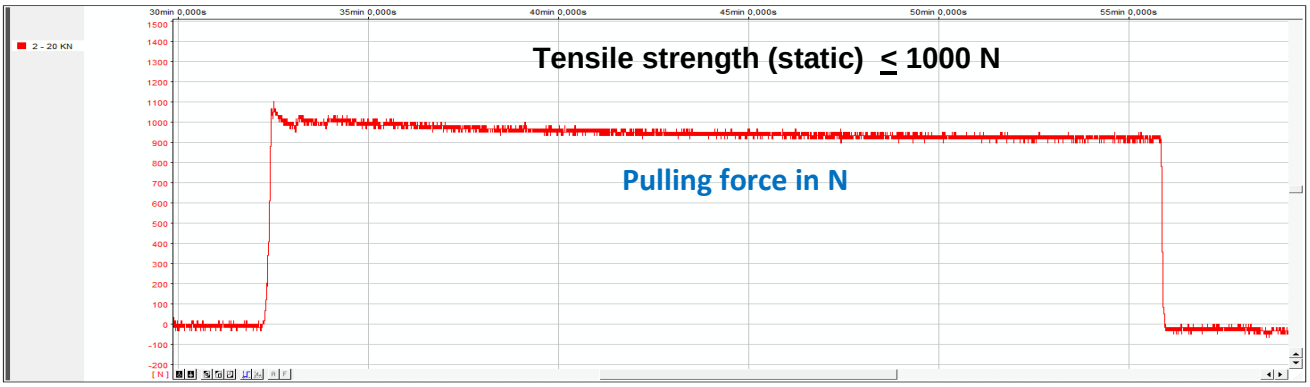


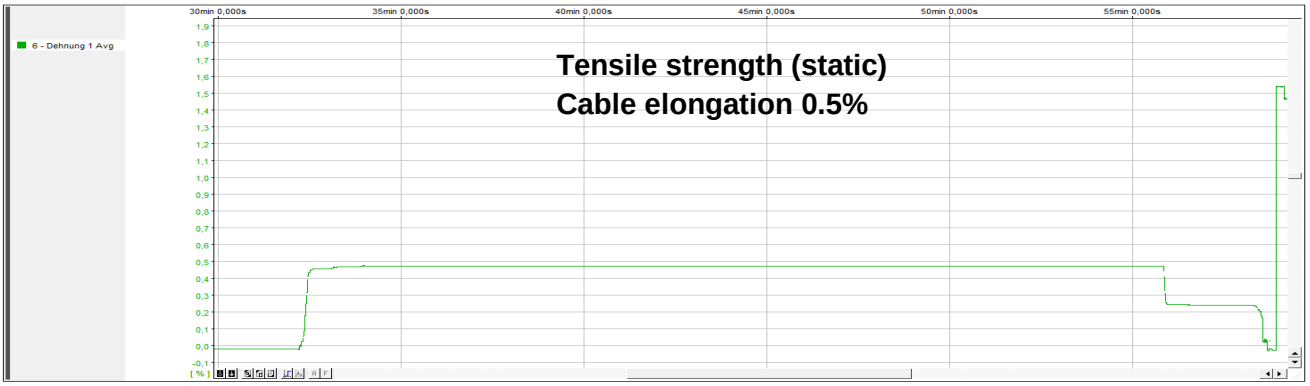
2nd test cycle
“dynamic test”

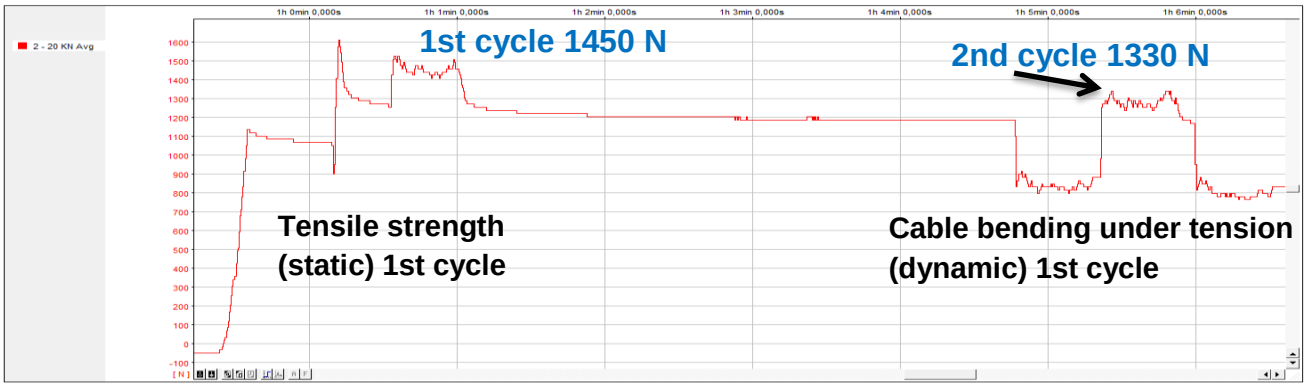


Test results

		Tensile strength	Cable bending under tension
IEC / DIN EN		60794-1-2 / E1A	60794-1-2 / E18A
Test		statisch	dynamisch
Pulling force			
Specified value	Fmax	≤ 6000N	≤ 6000N
Nominal value	Fmin	≤1000N /1450N	≤ 1330N (1st cycle)/ ≤ 3300 N (2nd cycle)
Cable elongation			
FO guideline	Fmax	≤ 0.7%	
FO guideline	Nom. value (Fmin)	≤ 0.5%	
Attenuation change			
Specified value	Fmax	≤ 0.05 dB	≤ 0.05 dB
NN		dB	Fibre breakage (2) (2nd cycle = 3300 N)
Querdruck			
Specified value	Fmax	≤ 0.05 dB	≤ 0,05 dB (2)
Nominal value		≤ 0.05 dB (1)	Fibre breakage (2) (2nd cycle = 3300 N)

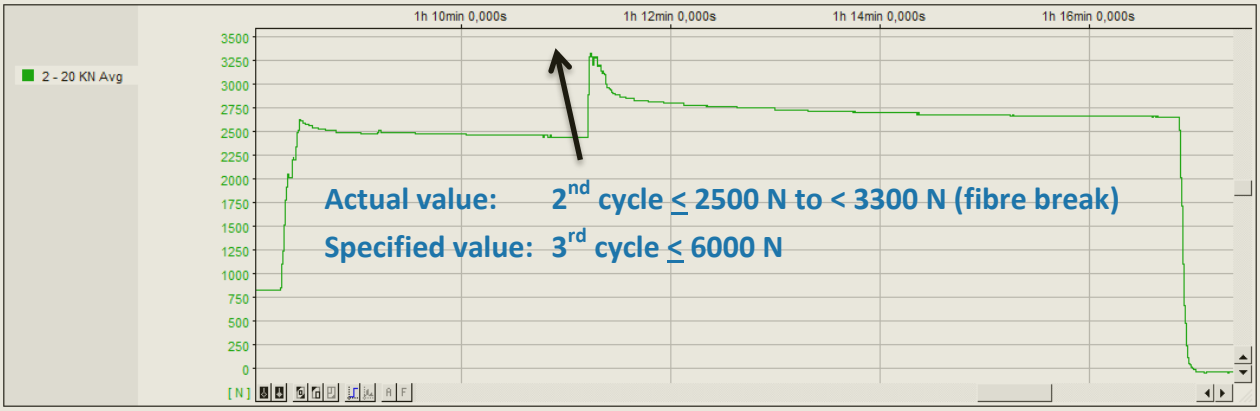


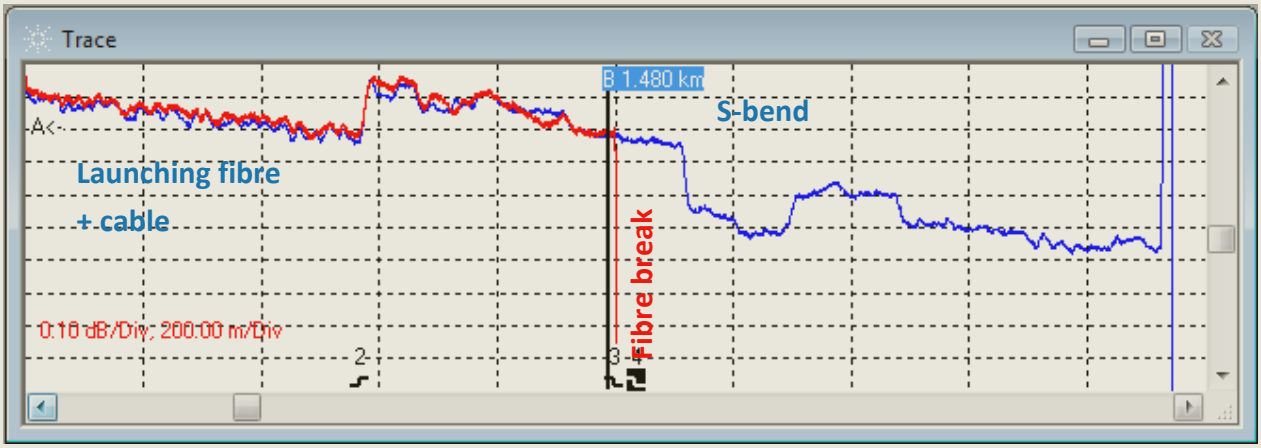




Test results

Cable bending under tension 2nd cycle (underground cable corner rollers) in acc. with IEC/EN 60794-1-2/E18A, dynamic test (v = 10 m/min)





Evidence from fault analysis, Case 1

The repeat of the pulling test over cable corner rollers clearly showed that were considerable design and technical processing faults in the cable manufacture. The requirements of standard DIN EN / IEC 60794-3-10 (2002 = Parag. 4.6.1 (testing method) 4.6.2.1 (tensile strength) 4.6.2.6 (crush) could never be technically fulfilled with this design.

Contact

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