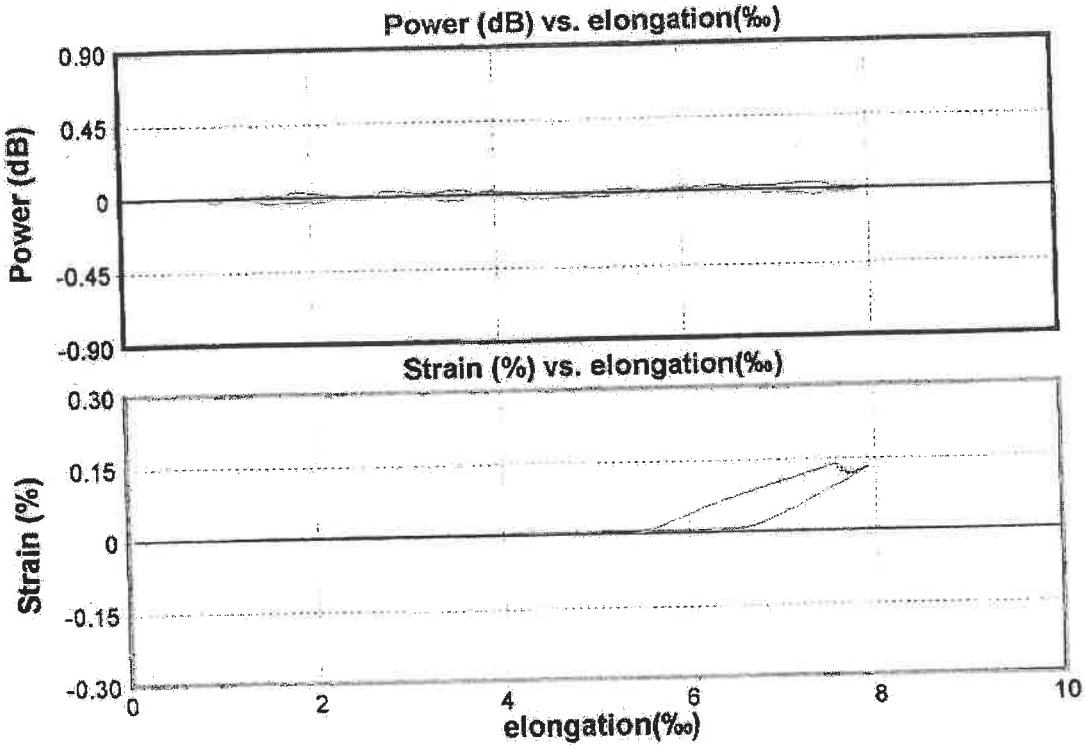
AFL 01-004

CD400 Strain Results

Date of measurement	: Monday,02 May 2011 at 12:41:11		
Fiber length	: 1.800 km		
Fiber ID	: FL6735 85%		
Message	: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)		
Operator	: Stevens		
Test file	: [1] ASLH1		
Results file name	: FL6735 85%.wsd		
System ID	: 25220	Sw version	: 4.8.3
Rep rate	: 3.0s	Group index	: 1.466
Wavelength	: 1550 nm	Correction	: 0.8



Fiber Fiber input

Power
Max power = 0.047 dB at 4053.1s
Min power = -0.028 dB at 228.9s

Strain
Max strain = 0.139 % at 408.8s
Min strain = 0.000 % at 0.0s

EXTERNAL INPUT J18
Max value = 7.930 elongation(‰) at 3837.0s
Min value = 0.813 elongation(‰) at 6.5s

Length
Max length = 2499.4 mm at 408.8s
Min length = 0.0 mm at 0.0s

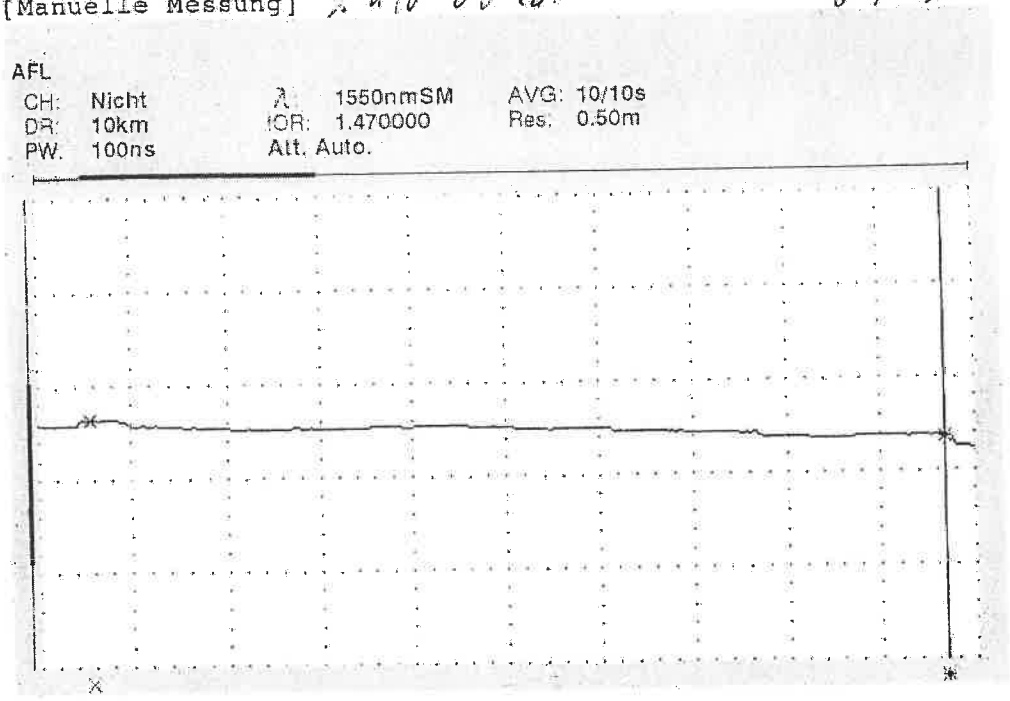
Delay
Max delay = 9777.8 ps at 408.8s
Min delay = 0.0 ps at 0.0s

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed

Name AFL

Datum 2011-Mai-02 09:21

0.250km/div 5.000dB/div
[Manuelle Messung] 2 kN Verlauf 6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.326dB	*:	2.985km
Faserdaempfg	:	0.570dB/km		
Tot. Rueckflussd. [2PA]	:	40.320dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11

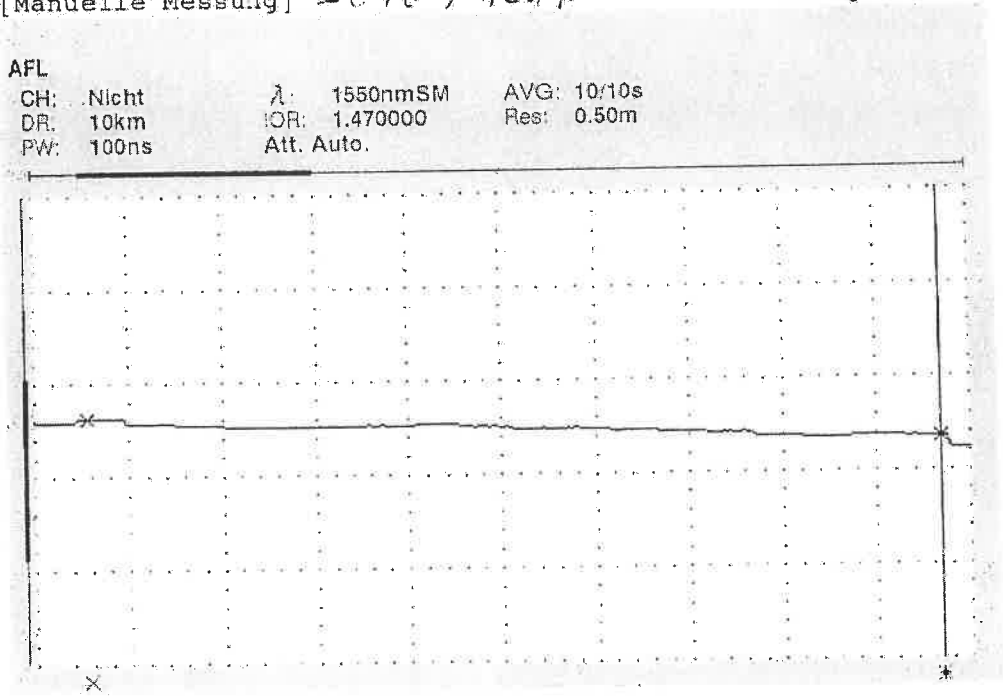
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 09:44

0.250km/div 5.000dB/div
[Manuelle Messung] 30% 14,2kN

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.328dB	*:	2.985km
Faserdaempfg	:	0.571dB/km		
Tot. Rueckflussd. [2PA]	:	40.320dB		

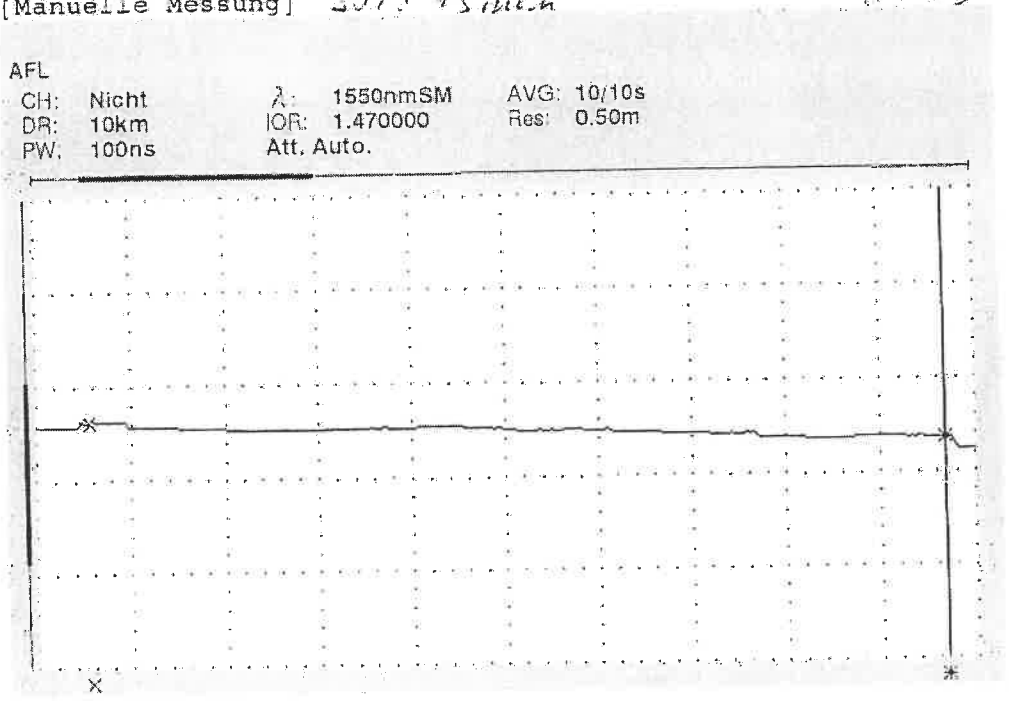
MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 02.05.11

Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 10:00

0.250km/div 5.000dB/div
[Manuelle Messung] 30°. 15 min



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.299dB	*:	2.985km
Faserdaempfg	:	0.558dB/km		
Tot. Rueckflussd. [2PA]	:	40.323dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11

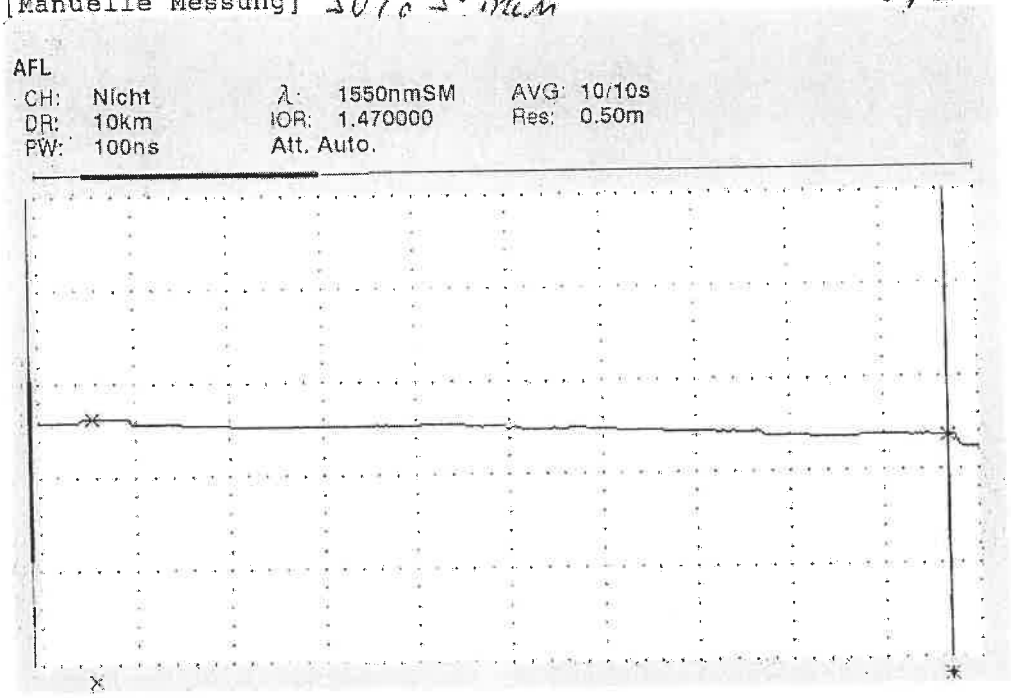
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 10:14

0.250km/div 5.000dB/div
[Manuelle Messung] 30% 30 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.320dB	*:	2.985km
Faserdaempfg	:	0.567dB/km		
Tot. Rueckflussd. [2PA]	:	40.322dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: Oct. 11
DF - 0038

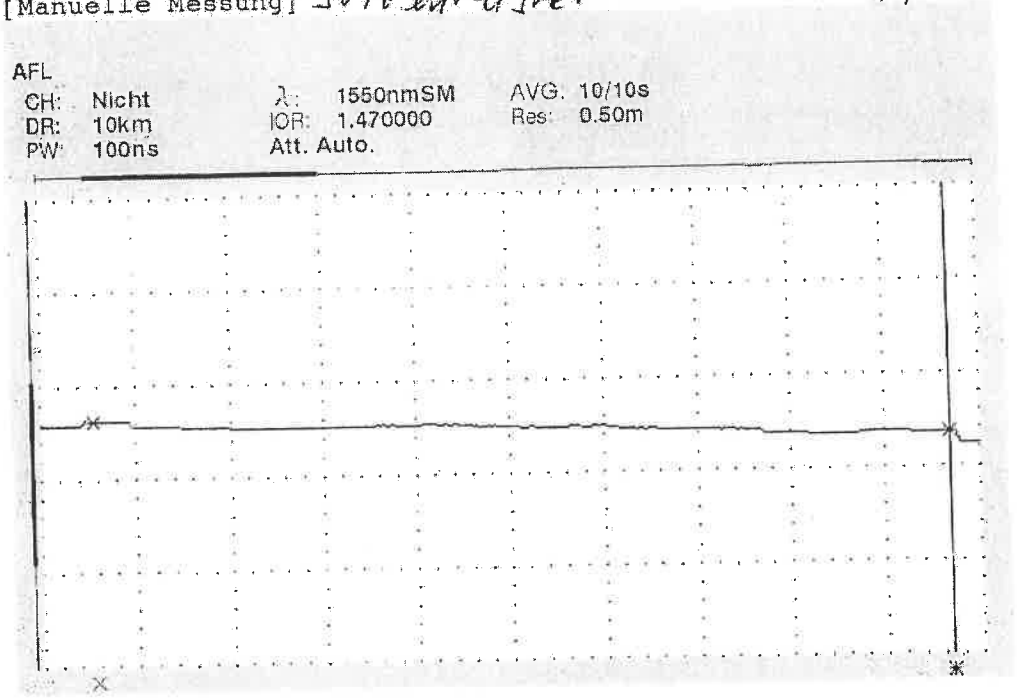
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 10:16

0,250km/div 5.000dB/div
[Manuelle Messung] 30% entlastet

#735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.302dB	*:	2.985km
Faserdaempfg	:	0.560dB/km		
Tot. Rueckflussd. [2PA]	:	40.333dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11
DE - 0039

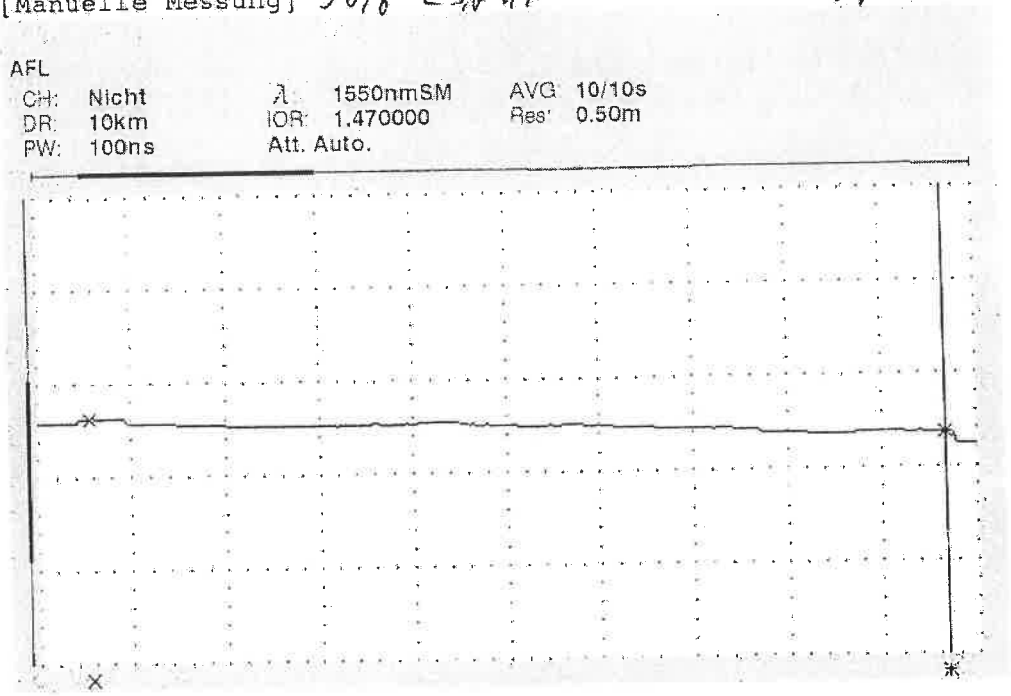
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 10:23

0.250km/div 5.000dB/div
[Manuelle Messung] 50% 23,4N

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.318dB	*:	2.985km
Faserdaempfg	:	0.567dB/km		
Tot. Rueckflussd. [2PA]	:	40.361dB		

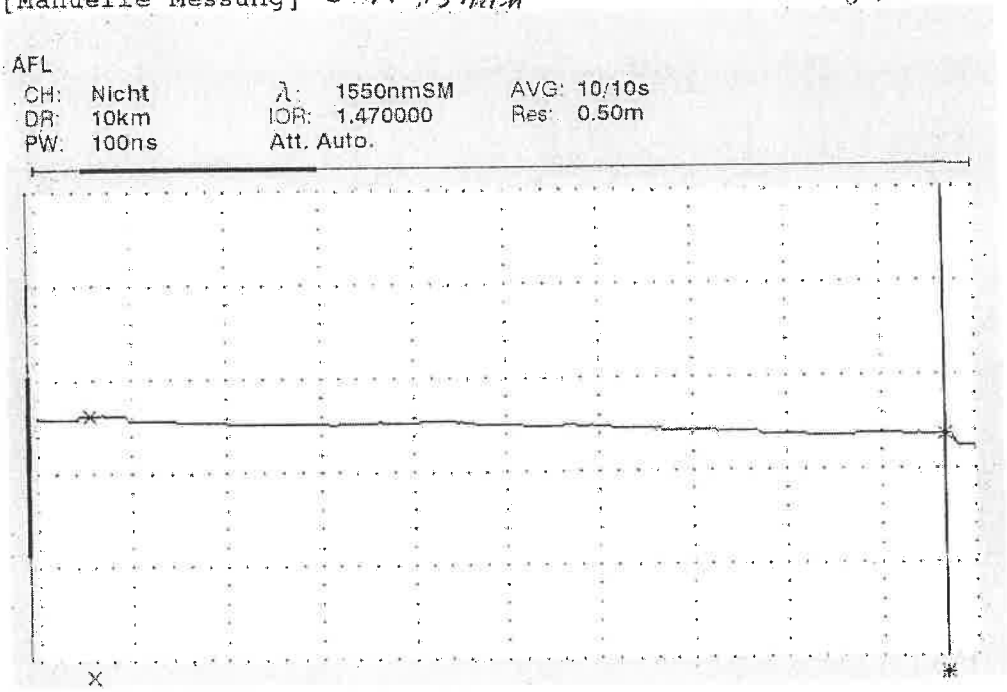
MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 04.05.11

Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 10:37

0.250km/div 5.000dB/div
[Manuelle Messung] 50% 15 min



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.325dB	*:	2.985km
Faserdaempfg	:	0.570dB/km		
Tot. Rueckflussd. [2PA]	:	40.349dB		

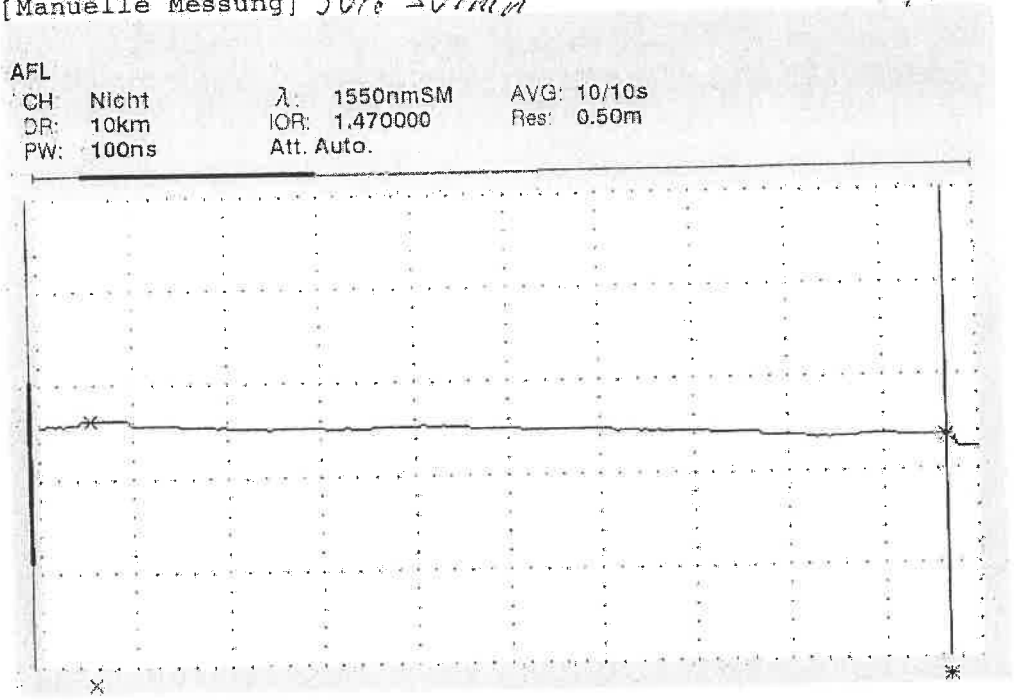
MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 02.05.11

Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 10:52

0.250km/div 5.000dB/div
[Manuelle Messung] 50% 30min



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.318dB	*:	2.985km
Faserdaempfg	:	0.567dB/km		
Tot. Rueckflussd. [2PA]	:	40.344dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 04.05.11

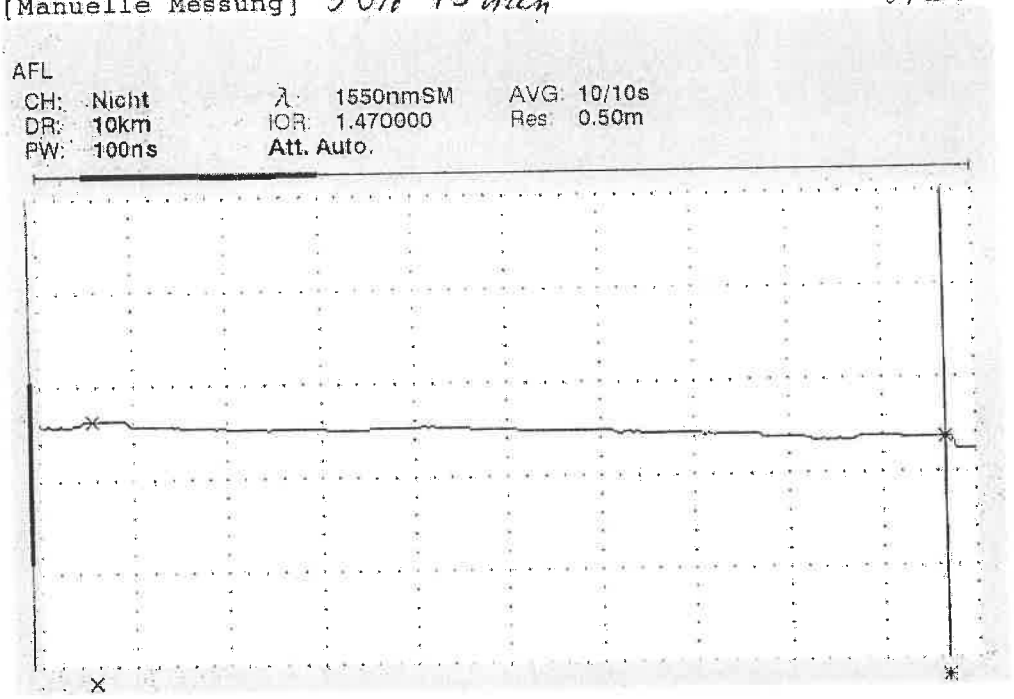
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 11:07

0.250km/div 5.000dB/div
[Manuelle Messung] 50% 45 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.315dB	*:	2.985km
Faserdaempfg	:	0.565dB/km		
Tot. Rueckflussd. [2PA]	:	40.359dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 04.05.11

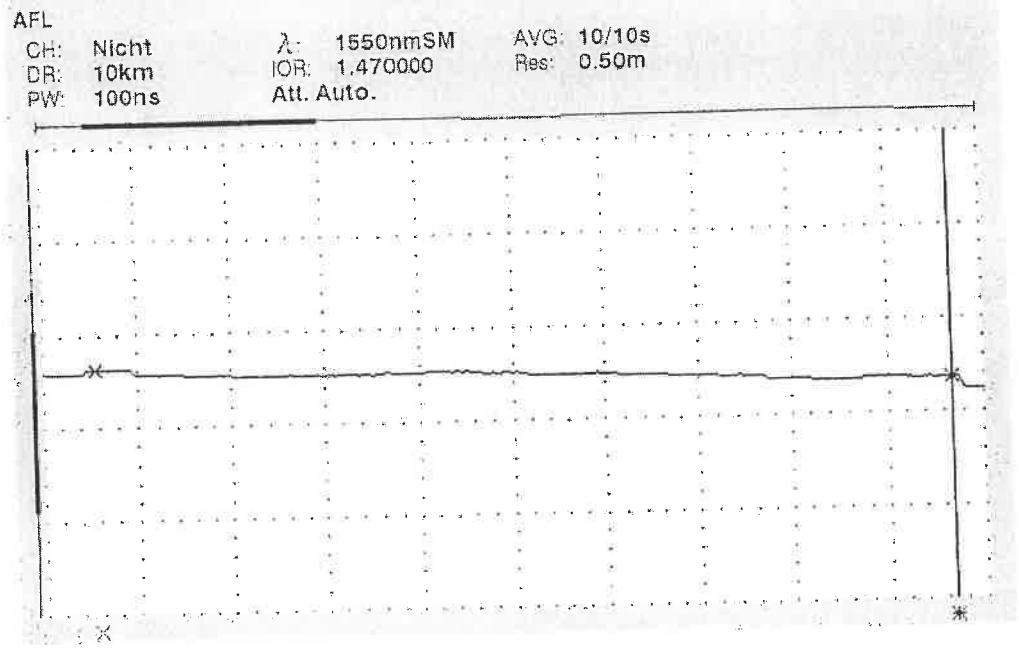
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 11:22

0.250km/div 5.000dB/div
[Manuelle Messung] 50% 60 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.295dB	*:	2.985km
Faserdaempfg	:	0.557dB/km		
Tot. Rueckflussd. [2PA]	:	40.335dB		

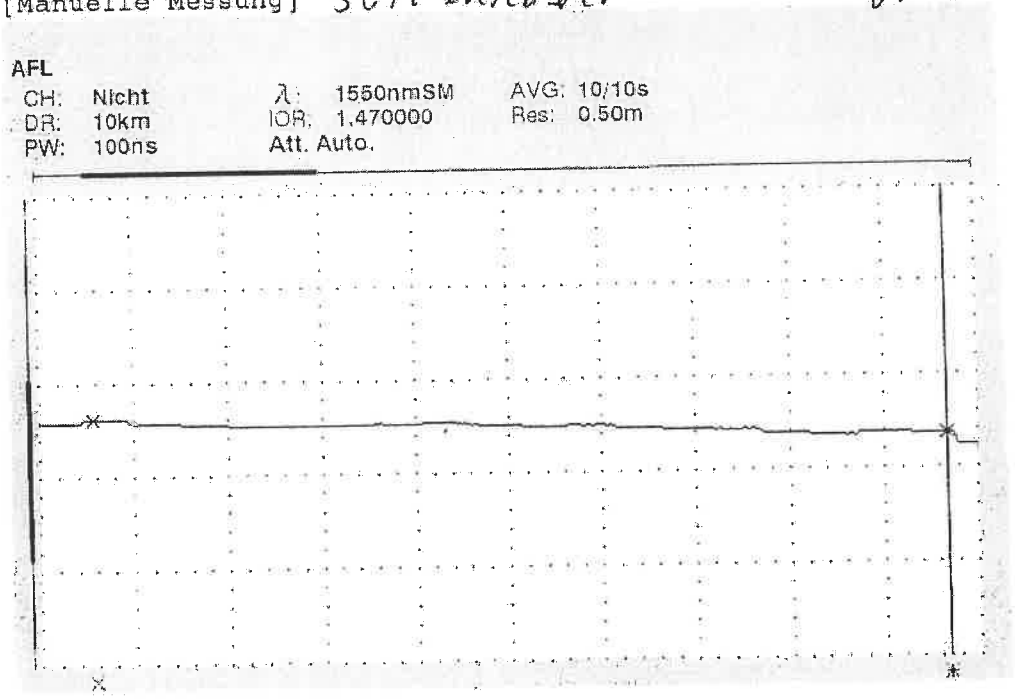
MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11
DE - 0039

Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 11:27

0.250km/div 5.000dB/div
[Manuelle Messung] 50% entlastet 6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.317dB	*:	2.985km
Faserdaempfg	:	0.566dB/km		
Tot. Rueckflussd. [2PA]	:	40.364dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11

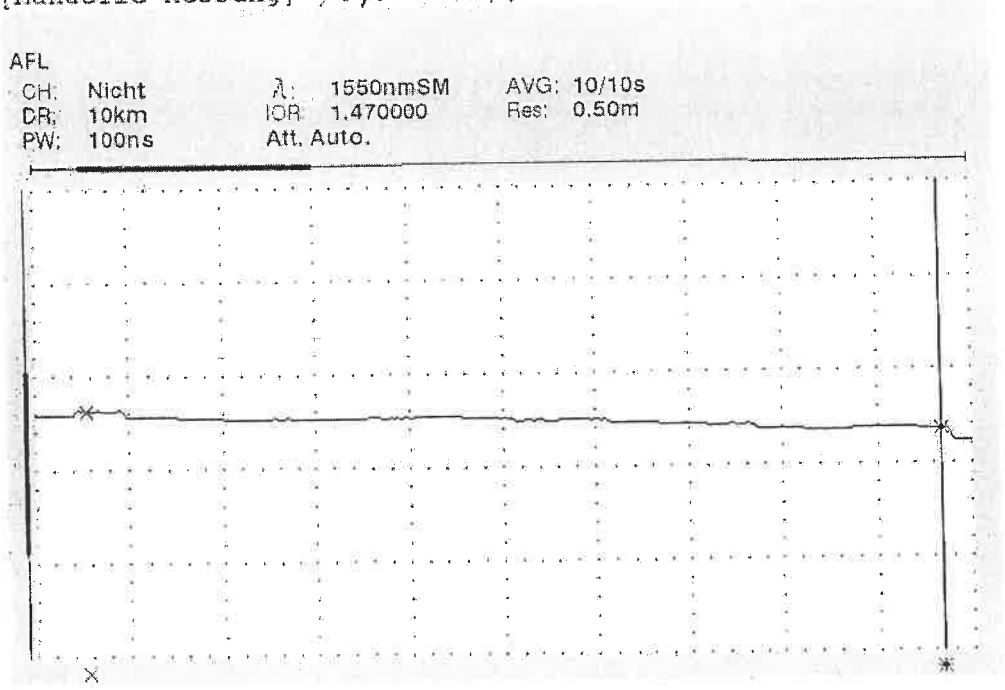
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 11:35

0.250km/div 5.000dB/div
[Manuelle Messung] 70% 33,1kN

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.331dB	*:	2.985km
Faserdaempfg	:	0.572dB/km		
Tot. Rueckflussd. [2PA]	:	40.336dB		

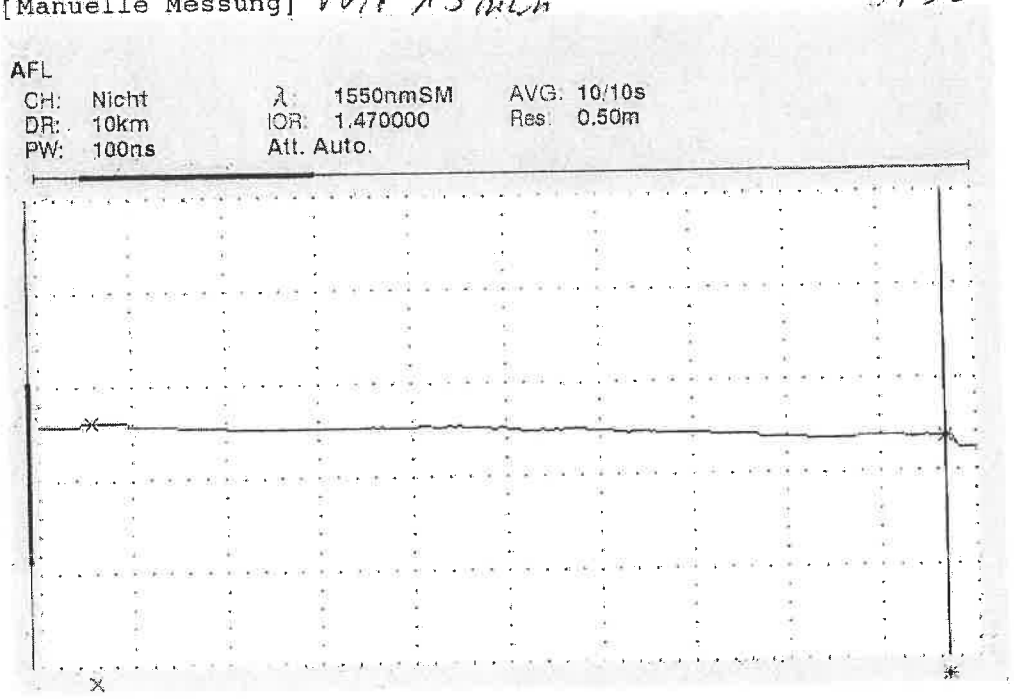
MOODY INTERNATIONAL
☐ Reviewed
☑ Witnessed
Date 04.05.11
DE - 0039

Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 11:50

0.250km/div 5.000dB/div
[Manuelle Messung] 70° 15 min



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.326dB	*:	2.985km
Faserdaempfg	:	0.570dB/km		
Tot. Rueckflussd. [2PA]	:	40.333dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 02.05.11

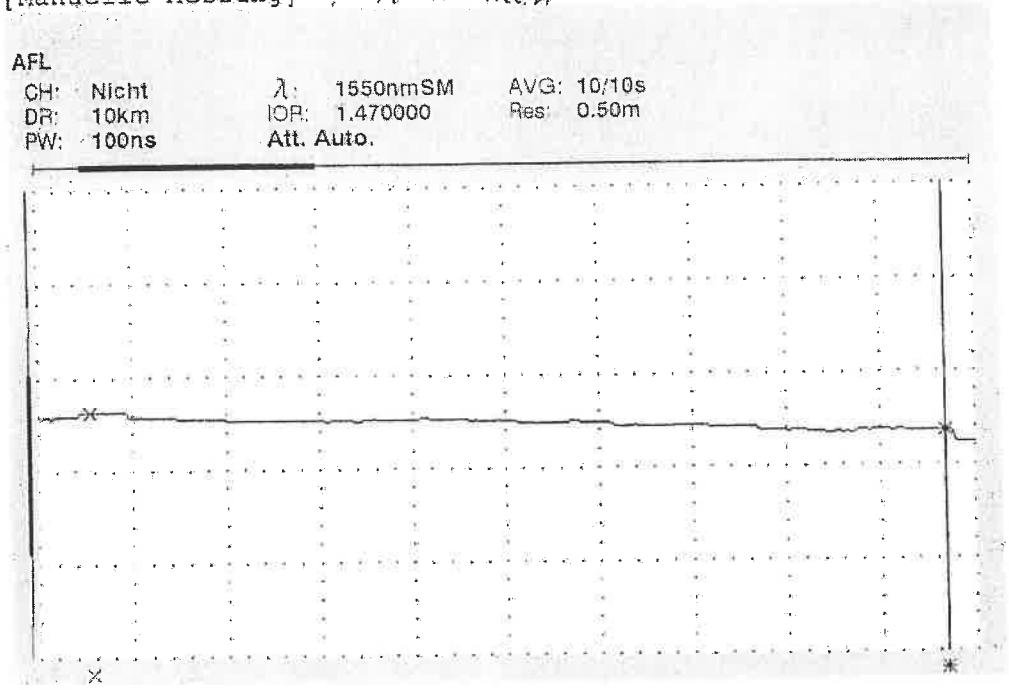
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 12:05

0.250km/div 5.000dB/div
[Manuelle Messung] 70% 30 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.321dB	*:	2.985km
Faserdaempfg	:	0.568dB/km		
Tot. Rueckflussd.	:	40.351dB		

[2PA]

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 02.05.11
DE - 0038

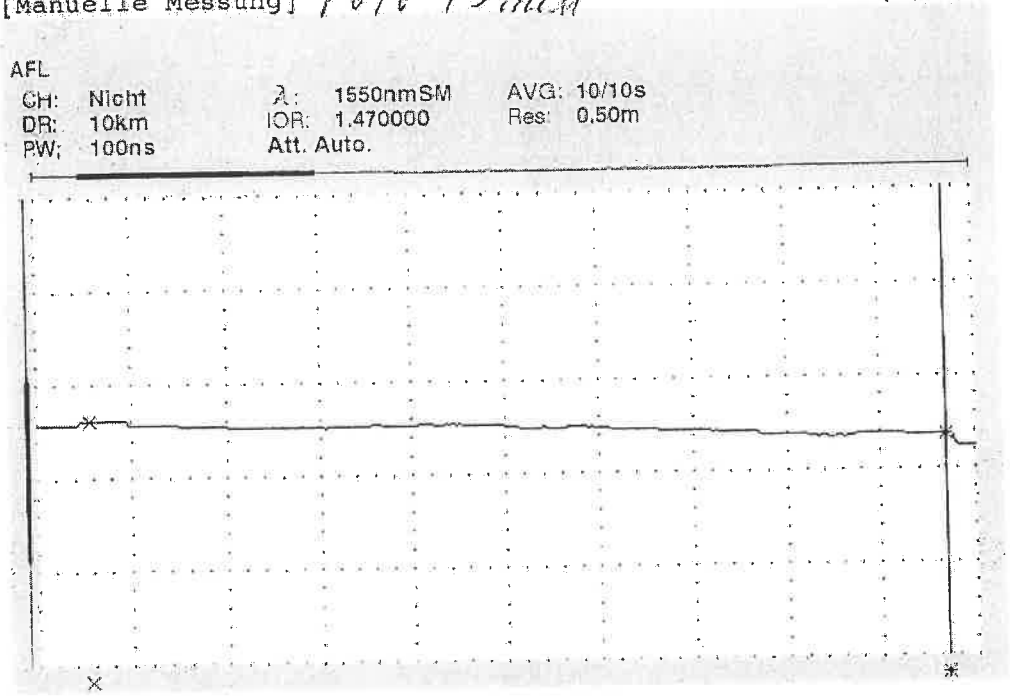
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 12:20

0.250km/div 5.000dB/div
[Manuelle Messung] 70% 45min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.319dB	*:	2.985km
Faserdaempfg	:	0.567dB/km		
Tot. Rueckflussd. [2PA]	:	40.336dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11

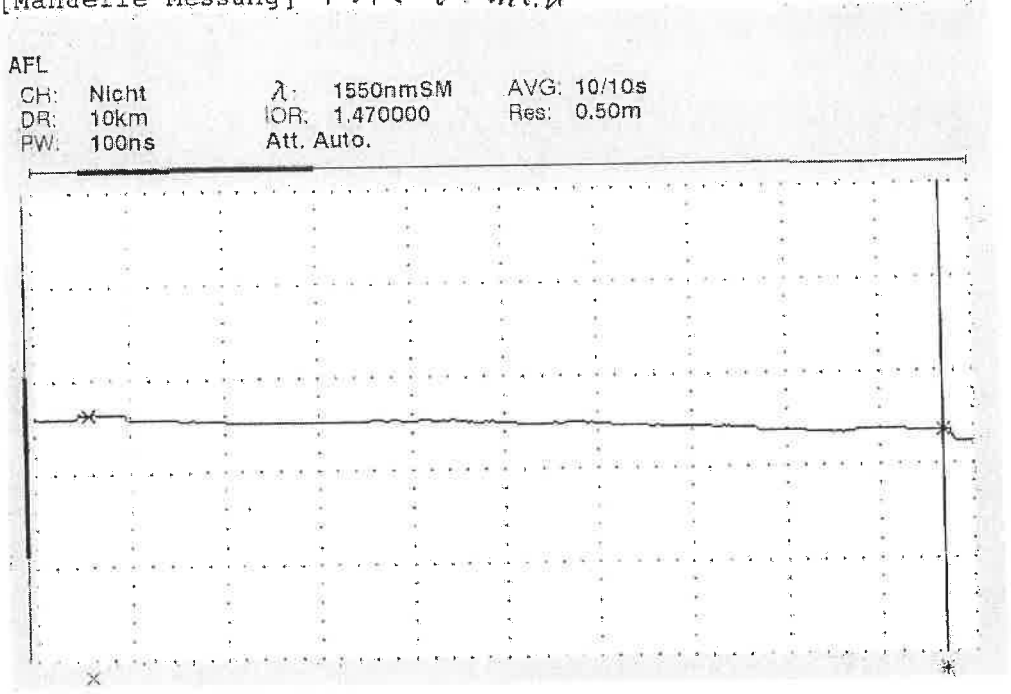
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 12:35

0.250km/div 5.000dB/div
[Manuelle Messung] 10% 60 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.328dB	*:	2.985km
Faserdaempfg	:	0.571dB/km		
Tot. Rueckflussd.	:	40.341dB		

[2PA]

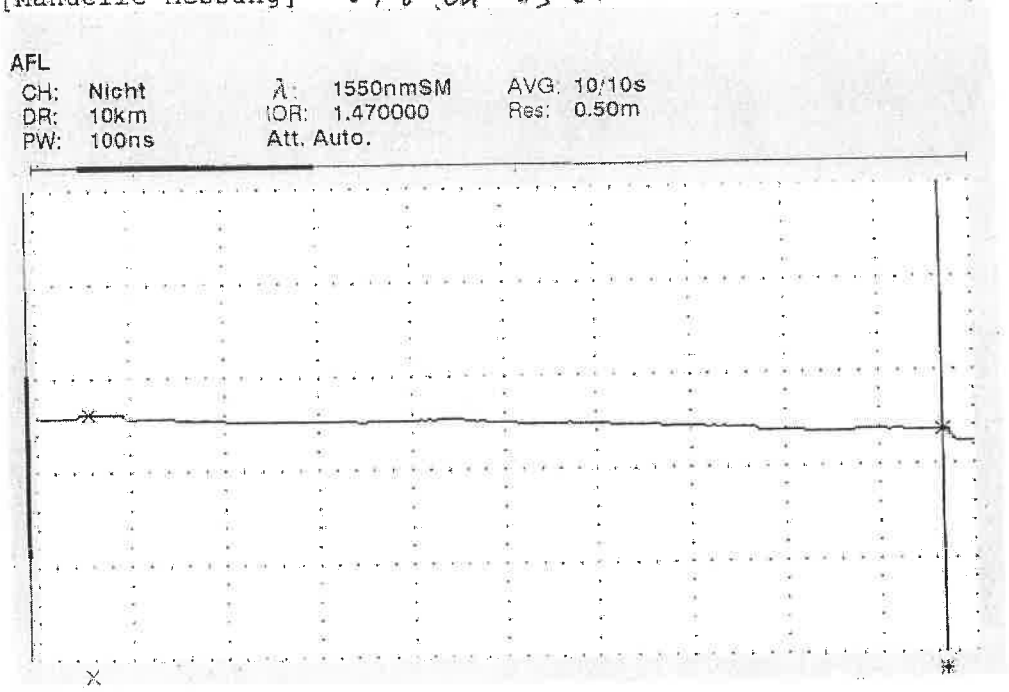
MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11

Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 12:40

0.250km/div 5.000dB/div
[Manuelle Messung] 20% entkostet 6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.304dB	*:	2.985km
Faserdaempfg	:	0.560dB/km		
Tot. Rueckflussd. [2PA]	:	40.331dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 04.05.11

Заличено по чл. 36а, ал.3 от ЗОП

3

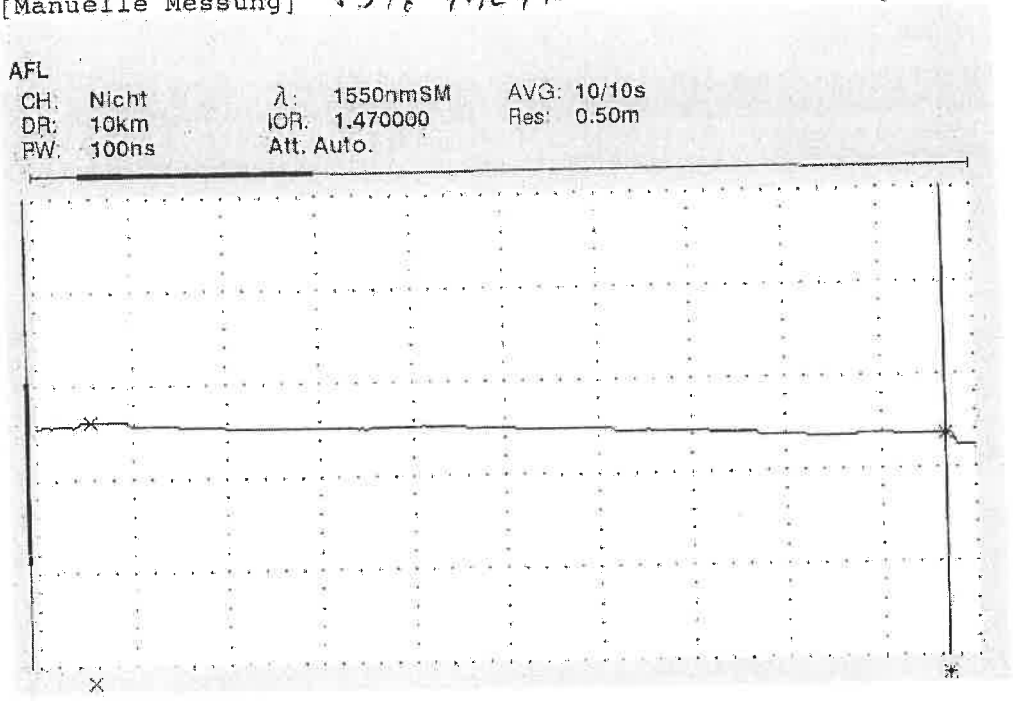
Name AFL

Datum 2011-Mai-02 12:50

0.250km/div 5.000dB/div
[Manuelle Messung]

85% 40,241B

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.320dB	*:	2.985km
Faserdaempfg	:	0.567dB/km		
Tot. Rueckflussd. [2PA]	:	40.320dB		

MOODY INTERNATIONAL
☐ Reviewed
☑ Witnessed
Date: 04.05.11

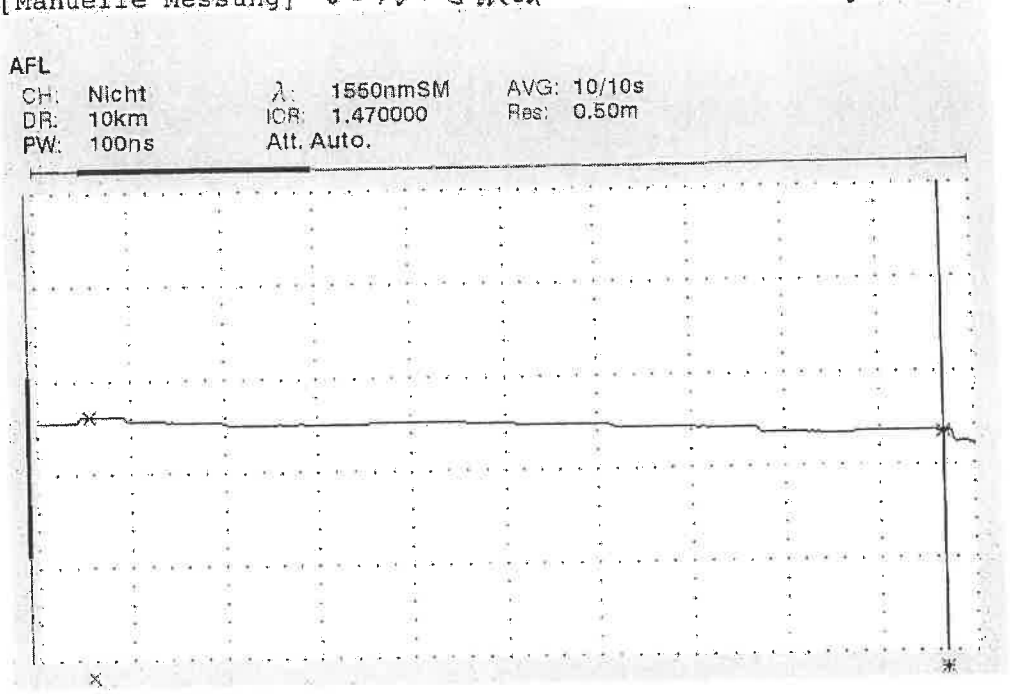
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 13:05

0.250km/div 5.000dB/div
[Manuelle Messung] 85% 15 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.341dB	*:	2.985km
Faserdaempfg	:	0.576dB/km		
Tot. Rueckflussd. [2PA]	:	40.334dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 02.05.11

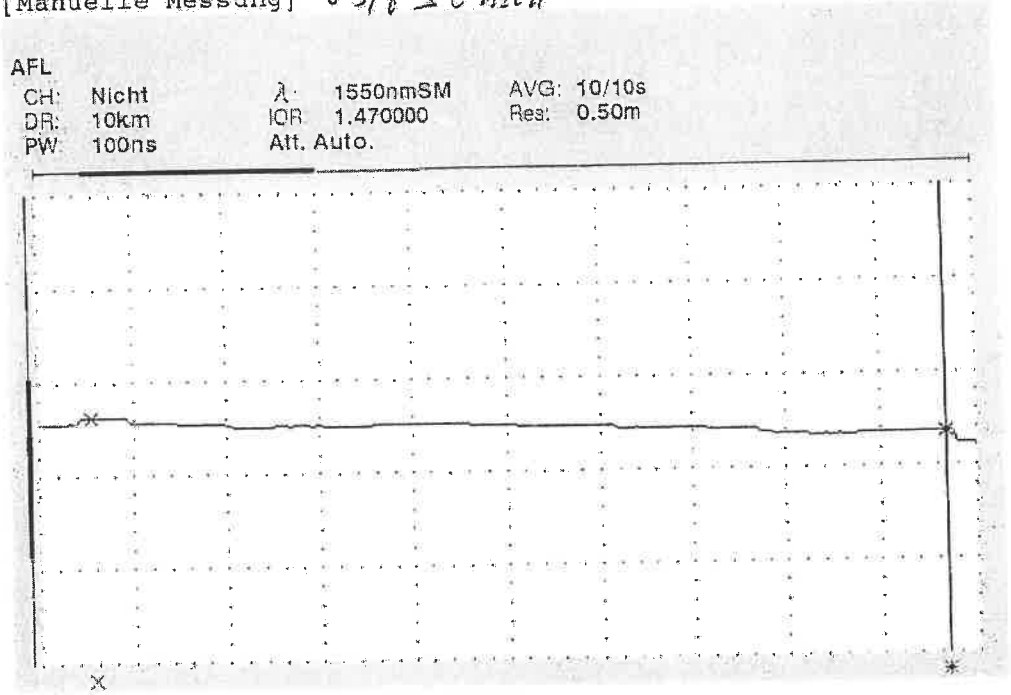
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 13:20

0.250km/div 5.000dB/div
[Manuelle Messung] 85% 30 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.322dB	*:	2.985km
Faserdaempfg	:	0.568dB/km		
Tot. Rueckflussd. [2PA]	:	40.313dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed

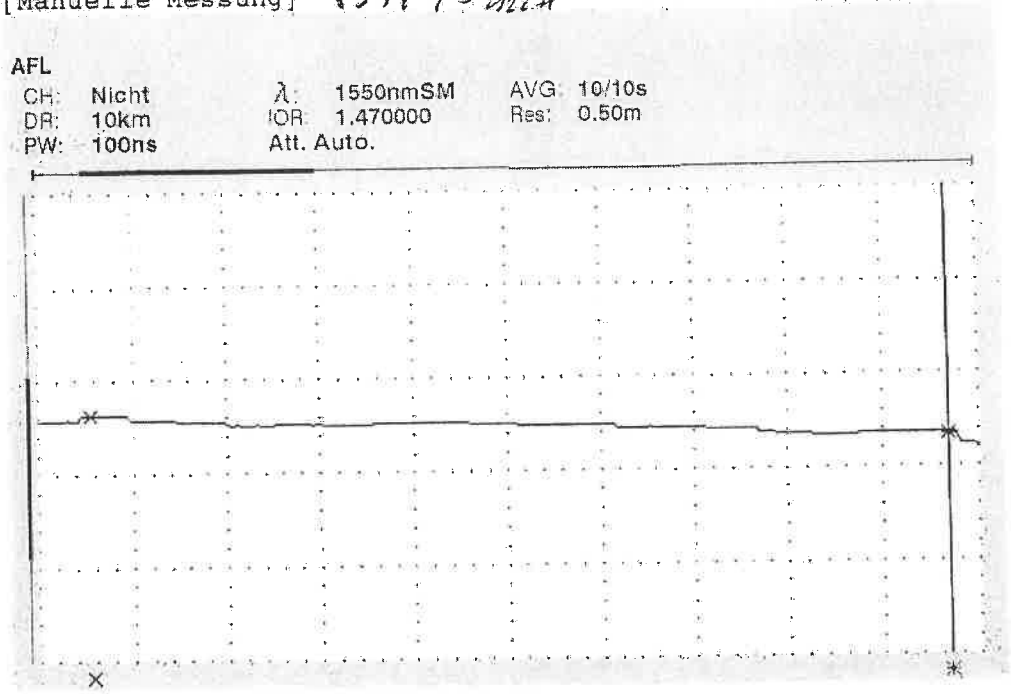
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 13:35

0,250km/div 5.000dB/div
[Manuelle Messung] 85%, 45 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.345dB	*:	2.985km
Faserdaempfg	:	0.578dB/km		
Tot. Rueckflussd. [2PA]	:	40.344dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 04.05.11

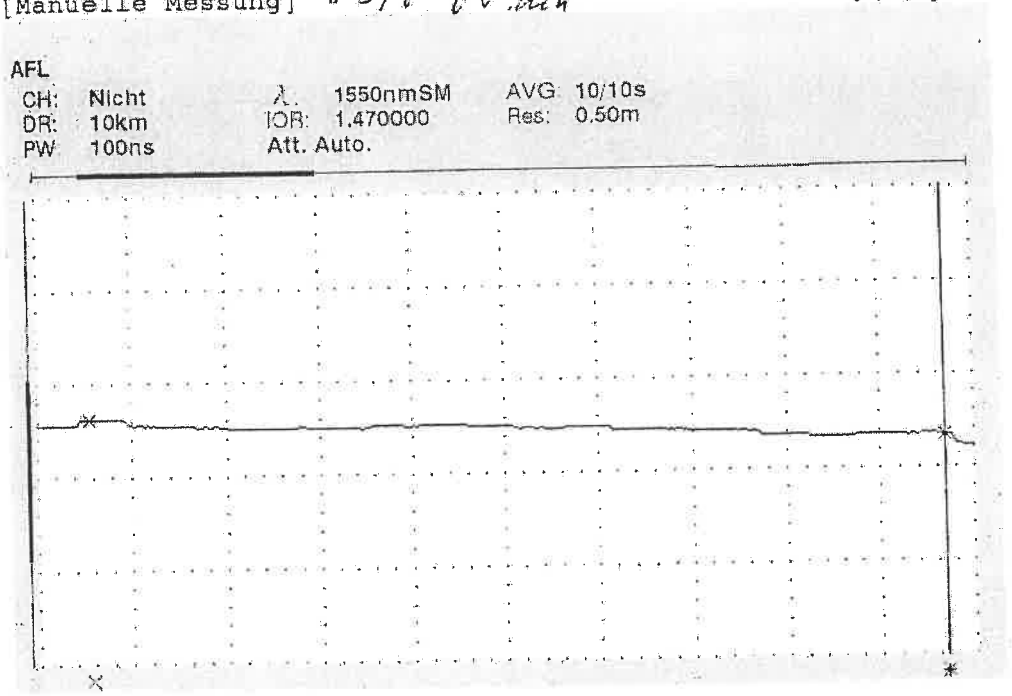
Заличено по чл. 36а, ал.3 от ЗОП

Name AFL

Datum 2011-Mai-02 13:50

0.250km/div 5.000dB/div
[Manuelle Messung] 85% 60 min

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.337dB	*:	2.985km
Faserdaempfg	:	0.575dB/km		
Tot. Rueckflussd. [2PA]	:	40.333dB		

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 02.05.11

Заличено по чл. 36а, ал.3 от ЗОП

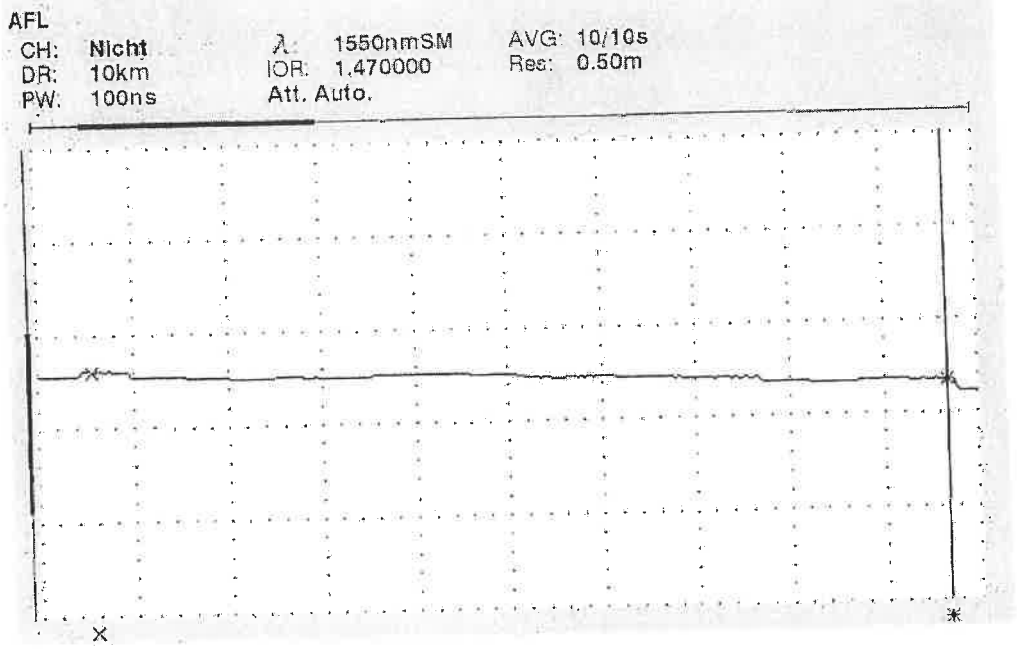
Name AFL

Datum 2011-Mai-02 13:57

0.250km/div 5.000dB/div
[Manuelle Messung]

25% entlastet

6735



Distanz	:	2.327km	x:	0.658km
Daempfung	:	1.312dB	*:	2.985km
Faserdaempfg	:	0.564dB/km		
Tot. Rueckflussd. [2PA]	:	40.314dB		

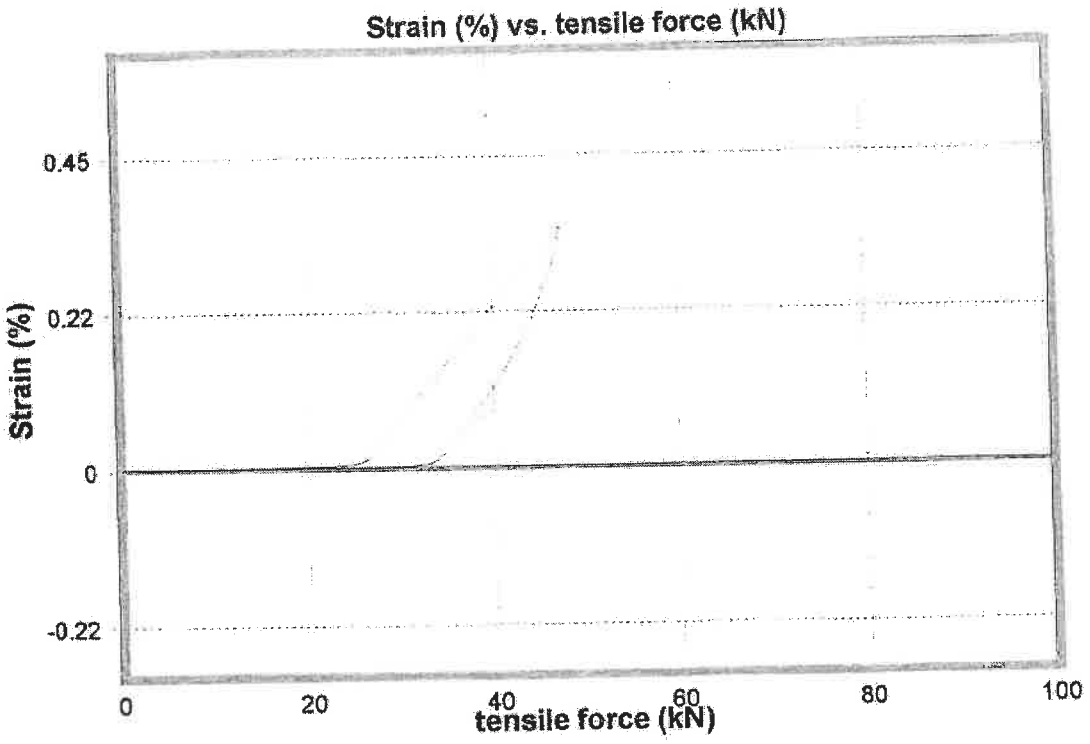
MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 02.05.11

Заличено по чл. 36а, ал.3 от ЗОП

AFL 01-004

CD400 Strain Results

Date of measurement	: Monday,02 May 2011 at 15:02:46		
Fiber length	: 1.800 km		
Fiber ID	: FL6735 100%		
Message	: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)		
Operator	: Stevens		
Test file	: [2] ASLH2		
Results file name	: FL6735 100%.wsd		
System ID	: 25220	Sw version	: 4.8.3
Rep rate	: 3.0s	Group index	: 1.466
Wavelength	: 1550 nm	Correction	: 0.8



Fiber Fiber input

Power
Max power = 0.009 dB at 555.9s
Min power = -0.060 dB at 906.7s
Strain
Max strain = 0.344 % at 582.3s
Min strain = 0.000 % at 0.0s
EXTERNAL INPUT J18
Max value = 47.420 tensile force (kN) at 576.8s
Min value = 0.068 tensile force (kN) at 117.8s

Length
Max length = 6189.7 mm at 582.3s
Min length = 0.0 mm at 0.0s
Delay
Max delay = 24214.5 ps at 582.3s
Min delay = 0.0 ps at 0.0s

MOODY INTERNATIONAL
☐ Reviewed
☑ Witnessed
Date: 06.05.11

Temperature Cycling Test

Annex 9

Cable type:	ASLH-D(S)B 36 SMF (A20SA 37 – 2,9)
Cable product spec.:	TK 10471/10-03
Cable-ID:	10283432/6557
Test procedure:	IEC 60794-1-2-F1
Measurement devices:	OTDR Temperature test chamber
Test conditions:	sample length: min. 1000m wavelength: 1550nm number of measured fibres: min. 10 temperature cycle: -45°C/+85°C number of cycles: 2
Requirement:	increase of att. 1550nm ≤ 0,2 dB/km
Results:	increase of att. 1550nm ≤ 0,014 dB/km

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 28.04-05.05.11
DE - 0038

Заличено по чл. 36а, ал.3 от ЗОП

temperature cycle test

Typ: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)
FA: 10283432
FL.: 6657

attenuation at 1310nm

	temp.	+20°C/1	+85°C/1	-45°C/1	+85°C/2	-45°C/2	+20°C/2
	fibre	(dB/km)	(dB/km)	(dB/km)	(dB/km)	(dB/km)	(dB/km)
1	bl	0,326	0,325	0,318	0,330	0,323	0,326
2	ye	0,332	0,337	0,333	0,339	0,332	0,335
3	gn	0,318	0,318	0,312	0,321	0,315	0,318
4	rd	0,321	0,325	0,315	0,326	0,318	0,322
5	vi	0,328	0,326	0,319	0,332	0,323	0,328
6	wh	0,323	0,324	0,322	0,326	0,318	0,324
7	or	0,315	0,320	0,318	0,325	0,317	0,318
8	br	0,329	0,331	0,327	0,334	0,327	0,329
9	gr	0,326	0,329	0,321	0,330	0,322	0,326
10	nt	0,329	0,328	0,324	0,333	0,326	0,327
11	pi	0,334	0,339	0,332	0,342	0,335	0,337
12	aq	0,331	0,335	0,326	0,337	0,330	0,333
13	bl-50-1	0,323	0,323	0,318	0,328	0,321	0,323
14	ye-50-1	0,338	0,338	0,336	0,343	0,337	0,339
15	gn-50-1	0,325	0,327	0,318	0,330	0,322	0,325
16	rd-50-1	0,317	0,324	0,318	0,324	0,317	0,320
17	vi-50-1	0,329	0,327	0,322	0,333	0,326	0,329
18	wh-50-1	0,323	0,324	0,318	0,329	0,324	0,326
19	or-50-1	0,328	0,328	0,322	0,332	0,326	0,327
20	br-50-1	0,330	0,332	0,324	0,333	0,327	0,329
21	gr-50-1	0,328	0,332	0,322	0,332	0,325	0,329
22	nt-50-1	0,330	0,328	0,321	0,333	0,327	0,330
23	pi-50-1	0,339	0,335	0,328	0,339	0,332	0,336
24	aq-50-1	0,339	0,339	0,334	0,343	0,335	0,337
25	bl-50-2	0,330	0,329	0,324	0,334	0,327	0,330
26	ye-50-2	0,326	0,329	0,318	0,330	0,321	0,326
27	gn-50-2	0,324	0,332	0,322	0,331	0,324	0,327
28	rd-50-2	0,333	0,335	0,329	0,339	0,332	0,335
29	vi-50-2	0,326	0,325	0,321	0,330	0,322	0,326
30	wh-50-2	0,330	0,339	0,331	0,338	0,331	0,335
31	or-50-2	0,339	0,337	0,334	0,343	0,336	0,339
32	br-50-2	0,329	0,329	0,340	0,334	0,328	0,330
33	gr-50-2	0,321	0,323	0,315	0,326	0,318	0,323
34	nt-50-2	0,351	0,349	0,344	0,353	0,348	0,350
35	pi-50-2	0,320	0,325	0,315	0,326	0,319	0,322
36	aq-50-2	0,338	0,339	0,334	0,342	0,334	0,338
	min.	0,315	0,318	0,312	0,321	0,315	0,318
	max.	0,351	0,349	0,344	0,353	0,348	0,350
	mean	0,329	0,330	0,324	0,333	0,326	0,329

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Date 22.09 - 25.09.11
DE - 0032

temperature cycle test

Typ: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)
FA: 10283432
FL.: 6657

change of attenuation at 1310nm with respect to the 1st 20C measurement

	temp.	+85°C/1	-45°C/1	+85°C/2	-45°C/2	+20°C/2
	fibre	(dB/km)	(dB/km)	(dB/km)	(dB/km)	(dB/km)
1	bl	-0,001	-0,008	0,004	-0,003	0,000
2	ye	0,005	0,001	0,007	0,000	0,003
3	gn	0,000	-0,006	0,003	-0,003	0,000
4	rd	0,004	-0,006	0,005	-0,003	0,001
5	vi	-0,002	-0,009	0,004	-0,005	0,000
6	wh	0,001	-0,001	0,003	-0,005	0,001
7	or	0,005	0,003	0,010	0,002	0,003
8	br	0,002	-0,002	0,005	-0,002	0,000
9	gr	0,003	-0,005	0,004	-0,004	0,000
10	nt	-0,001	-0,005	0,004	-0,003	-0,002
11	pi	0,005	-0,002	0,008	0,001	0,003
12	aq	0,004	-0,005	0,006	-0,001	0,002
13	bl-50-1	0,000	-0,005	0,005	-0,002	0,000
14	ye-50-1	0,000	-0,002	0,005	-0,001	0,001
15	gn-50-1	0,002	-0,007	0,005	-0,003	0,000
16	rd-50-1	0,007	0,001	0,007	0,000	0,003
17	vi-50-1	-0,002	-0,007	0,004	-0,003	0,000
18	wh-50-1	0,001	-0,005	0,006	0,001	0,003
19	or-50-1	0,000	-0,006	0,004	-0,002	-0,001
20	br-50-1	0,002	-0,006	0,003	-0,003	-0,001
21	gr-50-1	0,004	-0,006	0,004	-0,003	0,001
22	nt-50-1	-0,002	-0,009	0,003	-0,003	0,000
23	pi-50-1	-0,004	-0,011	0,000	-0,007	-0,003
24	aq-50-1	0,000	-0,005	0,004	-0,004	-0,002
25	bl-50-2	-0,001	-0,006	0,004	-0,003	0,000
26	ye-50-2	0,003	-0,008	0,004	-0,005	0,000
27	gn-50-2	0,008	-0,002	0,007	0,000	0,003
28	rd-50-2	0,002	-0,004	0,006	-0,001	0,002
29	vi-50-2	-0,001	-0,005	0,004	-0,004	0,000
30	wh-50-2	0,009	0,001	0,008	0,001	0,005
31	or-50-2	-0,002	-0,005	0,004	-0,003	0,000
32	br-50-2	0,000	0,011	0,005	-0,001	0,001
33	gr-50-2	0,002	-0,006	0,005	-0,003	0,002
34	nt-50-2	-0,002	-0,007	0,002	-0,003	-0,001
35	pi-50-2	0,005	-0,005	0,006	-0,001	0,002
36	aq-50-2	0,001	-0,004	0,004	-0,004	0,000
	min.	-0,004	-0,011	0,000	-0,007	-0,003
	max.	0,009	0,011	0,010	0,002	0,005
	mean	0,002	-0,004	0,005	-0,002	0,001

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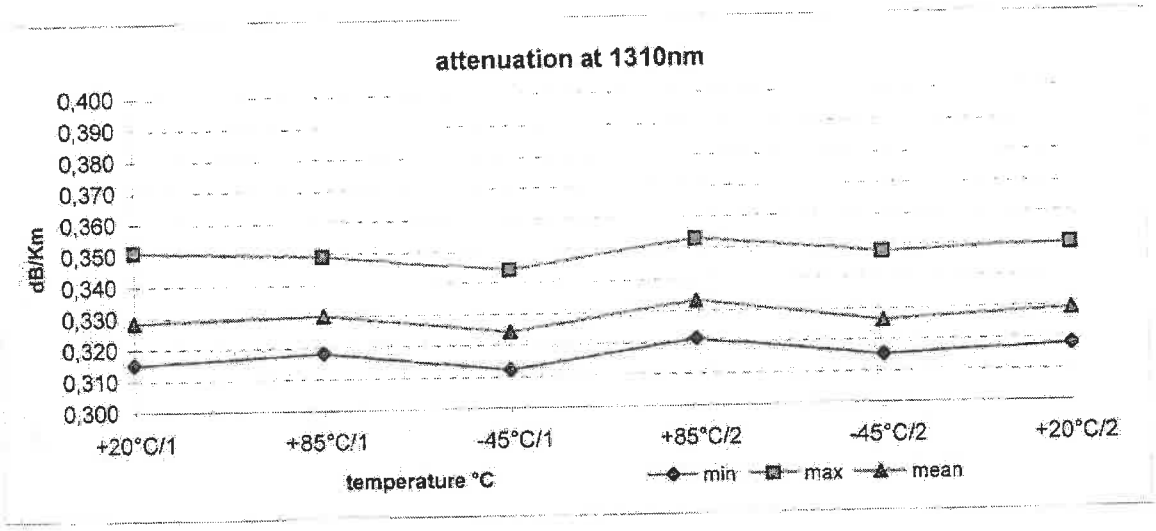
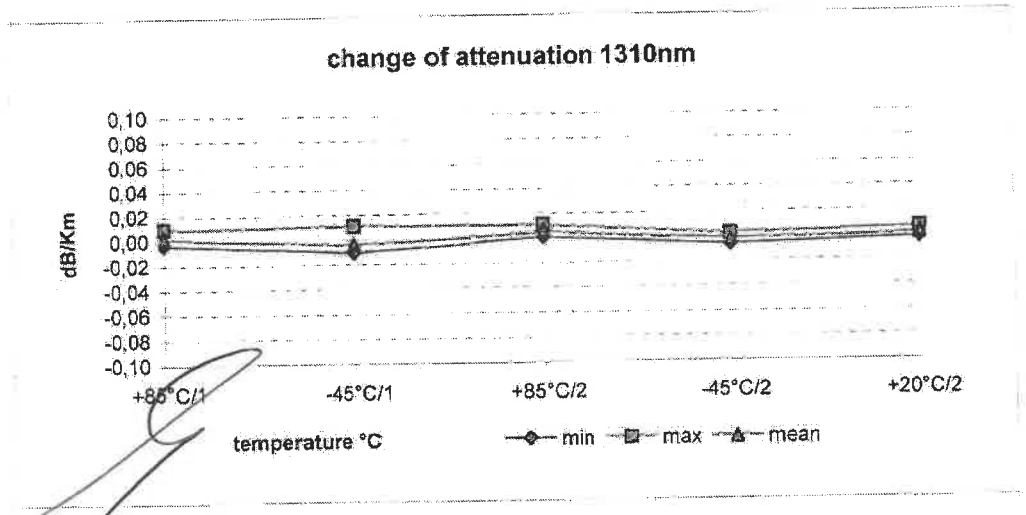
Date 27-04-05.05.17

temperature cycle test

Typ: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)
FA: 10283432
FL.: 6657





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☒ Witnessed
Date 27.04-05.11.

Заличено по чл. 36а, ал.3 от ЗОП

t_cycle_test_A20SA-37-smf, 1310nm

temperature cycle test

Typ: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)
FA: 10283432
FL.: 6657

attenuation at 1550nm

	temp.	+20°C/1	+85°C/1	-45°C/1	+85°C/2	-45°C/2	+20°C/2
	fibre	(dB/km)	(dB/km)	(dB/km)	(dB/km)	(dB/km)	(dB/km)
1	bl	0,192	0,193	0,184	0,194	0,191	0,192
2	ye	0,197	0,204	0,199	0,205	0,198	0,201
3	gn	0,185	0,189	0,184	0,188	0,184	0,186
4	rd	0,189	0,190	0,188	0,192	0,187	0,189
5	vi	0,189	0,195	0,187	0,193	0,188	0,190
6	wh	0,194	0,196	0,192	0,197	0,189	0,192
7	or	0,188	0,194	0,190	0,195	0,190	0,191
8	br	0,192	0,196	0,191	0,196	0,190	0,191
9	gr	0,194	0,197	0,191	0,198	0,192	0,194
10	nt	0,194	0,192	0,191	0,194	0,190	0,192
11	pi	0,199	0,203	0,198	0,204	0,199	0,199
12	aq	0,196	0,200	0,189	0,202	0,195	0,197
13	bl-50-1	0,192	0,191	0,187	0,196	0,191	0,192
14	ye-50-1	0,199	0,202	0,199	0,202	0,199	0,198
15	gn-50-1	0,194	0,197	0,190	0,195	0,190	0,192
16	rd-50-1	0,187	0,193	0,187	0,193	0,187	0,189
17	vi-50-1	0,192	0,192	0,189	0,195	0,190	0,191
18	wh-50-1	0,192	0,191	0,184	0,194	0,189	0,192
19	or-50-1	0,190	0,195	0,191	0,196	0,191	0,193
20	br-50-1	0,193	0,197	0,192	0,196	0,191	0,192
21	gr-50-1	0,197	0,200	0,195	0,200	0,195	0,197
22	nt-50-1	0,194	0,194	0,188	0,196	0,192	0,193
23	pi-50-1	0,199	0,200	0,199	0,203	0,197	0,198
24	aq-50-1	0,196	0,197	0,194	0,200	0,195	0,197
25	bl-50-2	0,196	0,198	0,189	0,199	0,194	0,196
26	ye-50-2	0,193	0,197	0,190	0,195	0,190	0,193
27	gn-50-2	0,194	0,198	0,194	0,200	0,193	0,195
28	rd-50-2	0,197	0,196	0,195	0,201	0,197	0,198
29	vi-50-2	0,193	0,193	0,188	0,196	0,190	0,192
30	wh-50-2	0,198	0,201	0,197	0,202	0,196	0,198
31	or-50-2	0,201	0,201	0,199	0,204	0,200	0,202
32	br-50-2	0,195	0,193	0,209	0,197	0,194	0,194
33	gr-50-2	0,193	0,194	0,190	0,196	0,191	0,193
34	nt-50-2	0,207	0,208	0,204	0,209	0,210	0,207
35	pi-50-2	0,190	0,197	0,191	0,197	0,192	0,194
36	aq-50-2	0,198	0,201	0,194	0,201	0,196	0,197
	min.	0,185	0,189	0,184	0,188	0,184	0,186
	max.	0,207	0,208	0,209	0,209	0,210	0,207
	mean	0,194	0,197	0,192	0,198	0,193	0,194

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Date 27.04-05.05.11

Заличено по чл. 36а, ал.3 от ЗОП

temperature cycle test

Typ: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)
FA: 10283432
FL.: 6657

change of attenuation at 1550nm with respect to the 1st 20C measurement

	temp.	+85°C/1	-45°C/1	+85°C/2	-45°C/2	+20°C/2
	fibre	(dB/km)	(dB/km)	(dB/km)	(dB/km)	(dB/km)
1	bl	0,001	-0,008	0,002	-0,001	0,000
2	ye	0,007	0,002	0,008	0,001	0,004
3	gn	0,004	-0,001	0,003	-0,001	0,001
4	rd	0,001	-0,001	0,003	-0,002	0,000
5	vi	0,006	-0,002	0,004	-0,001	0,001
6	wh	0,002	-0,002	0,003	-0,005	-0,002
7	or	0,006	0,002	0,007	0,002	0,003
8	br	0,004	-0,001	0,004	-0,002	-0,001
9	gr	0,003	-0,003	0,004	-0,002	0,000
10	nt	-0,002	-0,003	0,000	-0,004	-0,002
11	pi	0,004	-0,001	0,005	0,000	0,000
12	aq	0,004	-0,007	0,006	-0,001	0,001
13	bl-50-1	-0,001	-0,005	0,004	-0,001	0,000
14	ye-50-1	0,003	0,000	0,003	0,000	-0,001
15	gn-50-1	0,003	-0,004	0,001	-0,004	-0,002
16	rd-50-1	0,006	0,000	0,006	0,000	0,002
17	vi-50-1	0,000	-0,003	0,003	-0,002	-0,001
18	wh-50-1	-0,001	-0,008	0,002	-0,003	0,000
19	or-50-1	0,005	0,001	0,006	0,001	0,003
20	br-50-1	0,004	-0,001	0,003	-0,002	-0,001
21	gr-50-1	0,003	-0,002	0,003	-0,002	0,000
22	nt-50-1	0,000	-0,006	0,002	-0,002	-0,001
23	pi-50-1	0,001	0,000	0,004	-0,002	-0,001
24	aq-50-1	0,001	-0,002	0,004	-0,001	0,001
25	bl-50-2	0,002	-0,007	0,003	-0,002	0,000
26	ye-50-2	0,004	-0,003	0,002	-0,003	0,000
27	gn-50-2	0,004	0,000	0,006	-0,001	0,001
28	rd-50-2	-0,001	-0,002	0,004	0,000	0,001
29	vi-50-2	0,000	-0,005	0,003	-0,003	-0,001
30	wh-50-2	0,003	-0,001	0,004	-0,002	0,000
31	or-50-2	0,000	-0,002	0,003	-0,001	0,001
32	br-50-2	-0,002	0,014	0,002	-0,001	-0,001
33	gr-50-2	0,001	-0,003	0,003	-0,002	0,000
34	nt-50-2	0,001	-0,003	0,002	0,003	0,000
35	pi-50-2	0,007	0,001	0,007	0,002	0,004
36	aq-50-2	0,003	-0,004	0,003	-0,002	-0,001
	min.	-0,002	-0,008	0,000	-0,005	-0,002
	max.	0,007	0,014	0,008	0,003	0,004
	mean	0,002	-0,002	0,004	-0,001	0,000

MOODY INTERNATIONAL
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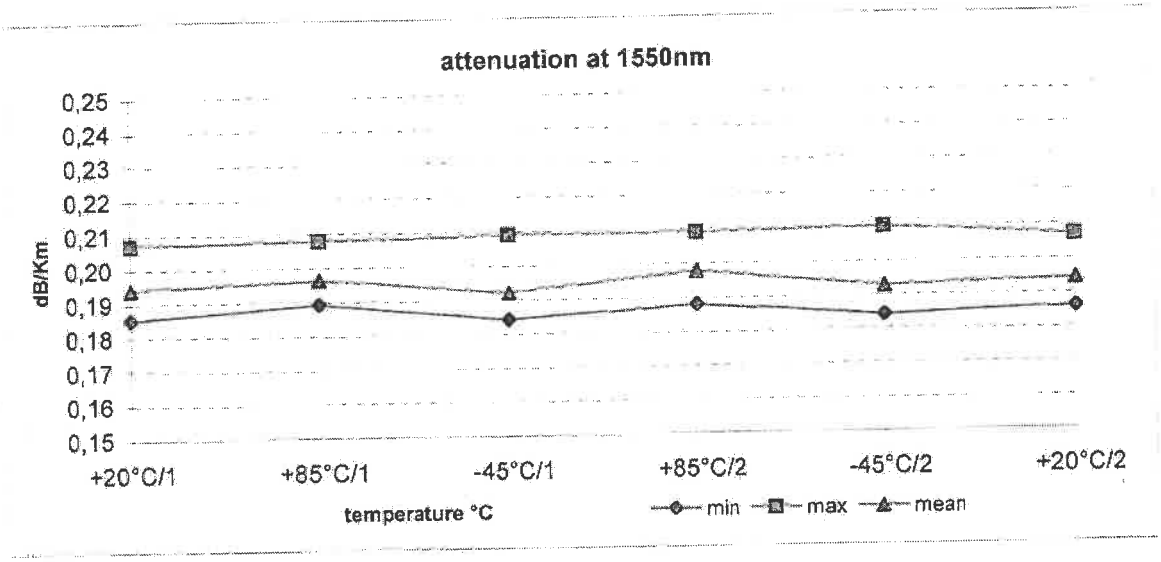
☒ Witnessed
Date 27.04.-05.05.11

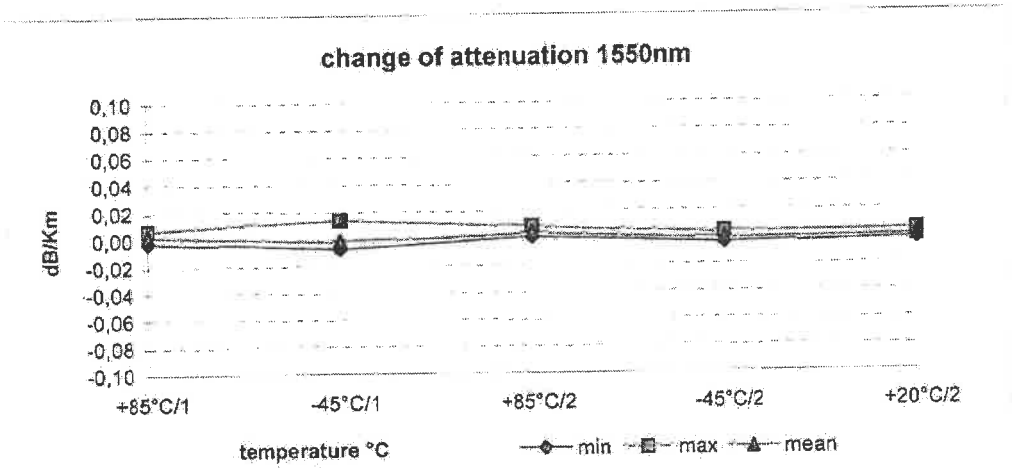
Заличено по чл. 36а, ал.3 от ЗОП

t_cy...e_test_A20SA-37-smf/1550nm

temperature cycle test

Typ: ASLH-D(S)B 36 SMF (A20SA 37 - 2,9)
FA: 10283432
FL.: 6657





MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 27.04.-05.05.11

Заличено по чл. 36а, ал.3 от ЗОП

t_cycle_test_A20SA-37-smf/1550nm

Aeolian Vibration Test

Annex 10

Cable type:	ASLH-D(S)B 36 SMF (A20SA 37 – 2,9)
Cable product spec.:	TK 10471/10-03
Cable-ID:	10283527/6735
Test procedure:	IEC 60794-1-2-E19

Measurement devices: Stabilised light source
Optical Power Meter
OTDR
Aeolian vibration test bench as described in the attached report

Test conditions:

length under test:	min. 30m
optical length:	min. 100m
fibres in a loop:	min. 10
test load:	20+/-5% RTS
number of cycles:	min. 10^7
vibration frequency:	(830/d +/- 10Hz)

Requirements: increase of att. 1550nm ≤ 1,0 dB/test fibre km
no damage of cable components

Results: increase of att. 1550nm ≤ 0,01 dB/test fibre km
no damage of cable components
see test report of independent laboratory

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 18.04.11

RIBE ELEKTROARMATUREN
Schwabach - Radebeul

Test Report
K 8764e

Title: **Aeolian Vibration Test on Optical Ground Wire ASLH-D(S)b 36 SMF (A20SA 37 – 2,9) - dia. 8,6 mm manufactured by AFL Telecommunications**

Type Test

File: 0.61

At the request of:	AFL Telecommunications GmbH
Test standard:	IEC 60794-1-2-E19 / 10-TMSS-04, rev. 0; 5.1.1e
Request for test No.:	1185
Contents:	16 pages

Summary:

An Aeolian Vibration Test according to IEC 60794-1-2-E19 was carried out in an indoor test span (40 m length) with Optical Ground Wire ASLH-D(S)b 36 SMF (A20SA 37 – 2,9) - dia. 8,6 mm.

Result:

No damage to any component of the cable, nor permanent or temporary increase in optical attenuation greater than 1,0 dB/test fiber km at 1550 nm was observed.

The requirements were fulfilled.

Hans-Jörg Krispin
Head of Engineering

Mario Dansachmüller
Senior Engineer

Schwabach, 02 May 2011

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 28/5-04.11

Заличено по чл. 36а, ал.3 от ЗОП

Accreditation:

The quality management system of Richard Bergner Elektroarmaturen GmbH & Co. KG is certified by TÜV NORD CERT GmbH in accordance with DIN EN ISO 9001:2000, certificate registration No. 04 100 950 150.

Adresses:

Manufacturer:	AFL Telecommunications GmbH Bonnenbroicher Str. 2-14 41238 Mönchengladbach, Germany
At the request of:	AFL Telecommunications GmbH Bonnenbroicher Str. 2-14 41238 Mönchengladbach, Germany
Test laboratory:	RIBE Test Laboratory Werk 2 Industriestr. 4 91126 Schwabach, Germany

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date 05.05.11
DE - 0039

Заличено по чл. 36а, ал.3 от ЗОП

Contents

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date 05.01.17

Заличено по чл. 36а, ал.3 от ЗОП

1. Cable data sheet

AFL Telecommunications
A Fujikura Business

18.10.2010, WS.
1201282200303-954216725 TK 10471/10-03

ASLH-D(S)b 36 SMF (A20SA 37 - 2,9)

Optical Ground Wire (OPGW)

according to EN 60794-4 standards

- Stranding direction of outer layer: right hand (Z-stranding)
- Wires acc. to EN 61232
- Maximum fibre capacity per steel tube: 36
- Fibres coloured acc. to colour code system 036 F SEC
- Fibres acc. to G.652
- Impregnated wooden drum with protection

Configuration

Center	1 Stainless Steel Tube with 36 SMF *Stainless steel tube material:* *DIN EN 10088-02, Mat. No 1.4404*	2,90 / 3,40 mm
Layer 1	7 A20SA - Wires	2,60 mm

Mechanical Data

Cable Diameter	8,6 mm
Cable Weight	275 kg/km
Supporting Cross Section	37,2 mm²
Rated Tensile Strength (RTS)	47,3 kN
Ratio RTS / Cable Weight	17,5 km
Modulus of Elasticity	162,0 kN/mm²
Thermal Elongation Coefficient	13,0 10^{-6}/K
Permissible Maximum Working Stress (42% RTS)	534,7 N/mm² (19,9kN)
Recommended Everyday Stress (16% RTS)	203,7 N/mm² (7,6kN)
Ultimate Exceptional Stress (72% RTS)	916,6 N/mm² (34,1kN)

Electrical Data

DC Resistance (20°C)		2,325 Ω/km
Conductivity		20,0% IACS
Short Time Current	(1,0s, 50-200°C)	2,9 kA
Short Time Current	(0,3s, 50-200°C)	5,3 kA
Short Time Current Capacity I²t	(50-200°C)	8,3 kA²s

Application

Maximum Permissible Installation Force		14,2 kN
Minimum Bending Radius	static	108 mm
	dynamic	129 mm
Normal Delivery Length		4000 m
Temperature Range	Installation	-10 to +50°C
	Transportation and Operation	-40 to +80°C

All Sizes and Values are Nominal Values

opgw_pro8.xls, Rev. 12-02

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Date 05.11.4

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Заличено по чл. 36а, ал.3 от ЗОП

2. Description of the test

2.1. Test Set-up

The test arrangement is shown schematically in Figure 1. The photo documentation in Appendix 1 gives details of the test arrangement.

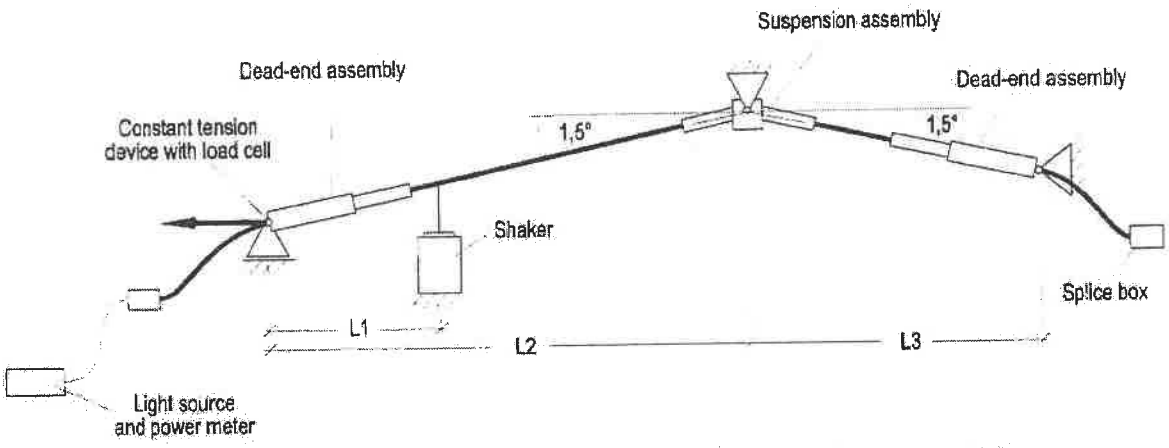

Figure 1: Schematical diagram of test set-up (L1 = 8,54 m, L2 = 28,14 m, L3 = 12,45 m)

The end abutments were used to load and maintain tension in the OPGW. The test section was contained between the two end abutments. The OPGW was cut approx. 5 m beyond the end abutments to allow removal of the cable outer strands and to allow access to the optical fibers.

Tension sets consisting of:

Thimble for dead end	RIBE Drg. No. F 2685/3
Dead end	RIBE Drg. No. AW 140 102
Protection rods	RIBE Drg. No. RW 090 240 lis

were installed on the OPGW to fit between the end abutments. The test sample was terminated at both ends prior to tensioning in a manner such that the optical fibres could not move relative to the cable. This was achieved by an excess length of approximately 5 m OPGW at each span extremity. A calibrated load cell was used to measure cable tension. The cable was tensioned to 9,5 kN (20 % of cable rated tensile strength). An automatically controlled screw-type constant tension device was used to maintain constant tension.

The length of the active span was 28,14 m, with a suspension assembly consisting of:

Protection rods	RIBE Drg. No. UTA 087 240 lis
Armour grip suspension	RIBE Drg. No. LTA 137 180

located approximately two thirds of the distance between the two dead-end assemblies. It was supported at a height such that the static sag angle of the OPGW to horizontal was 1,5° on both sides of the support point.

The mid-loop (antinode) vibration amplitude was measured and monitored with a non-contact optical displacement sensor at a free loop in the active span.

An electronically controlled shaker was used to excite the OPGW in the vertical plane. The shaker armature was securely fastened to the OPGW so that it was perpendicular to the OPGW in the vertical plane. The shaker was located in the span such that 16 free vibration loops built up between the suspension assembly and the shaker.

36 fibers of a total of 36 fibers were spliced in series giving a total fiber test length of 1461,24 m (36 x 40,59 m) between the dead-end assemblies. The power level for the initial optical

measurement provided a reference level. The difference between the actual power level and the reference level indicated the change in attenuation of the test fibers.

A Stabilized Light Source Anritsu MG9002A with a wave length of 1550 nm was used as light source. The light signal was fed into the OPGW and the optical measurement of the signal after passing the OPGW were made with an Optical Power Meter Anritsu ML 910A. Readings of the optical attenuation were taken every minute during the test.

The measuring equipment was provided by AFL.

Ambient temperature was measured with a thermocouple.

2.2. Test conditions

Specified number of vibration cycles	10×10^6
Specified vibration frequency (nearest resonant frequency to (830/d ± 10%) Hz (with diameter of cable d=8,6 mm)	96,5 Hz
Actual vibration frequency	90,0 Hz
Actual peak-to-peak amplitude, average	2,87 mm
Total length of the fibers under test	1461,24 m (36 x 40,59 m)
Start of test	28 April 2011, 10 hrs 45

2.3. Test requirements

Any significant damage to any component of the cable, or permanent or temporary increase in optical attenuation greater than 1,0 dB at 1550 nm shall constitute failure.

3. Test results

The test was terminated on 30 April 2011, 9 hours 30 after 15,1 million cycles.

- Variation of optical attenuation during the test was found to be within ±0,01 dB at 1550 nm. This is well below the specified maximum value of 1,0 dB/test fiber km.
- No mechanical damage to any component of the cable was observed.

The requirements were fulfilled.

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☐ Reviewed
☒ Witnessed
Date 28/30.04.11

Appendix 1: Diagrams

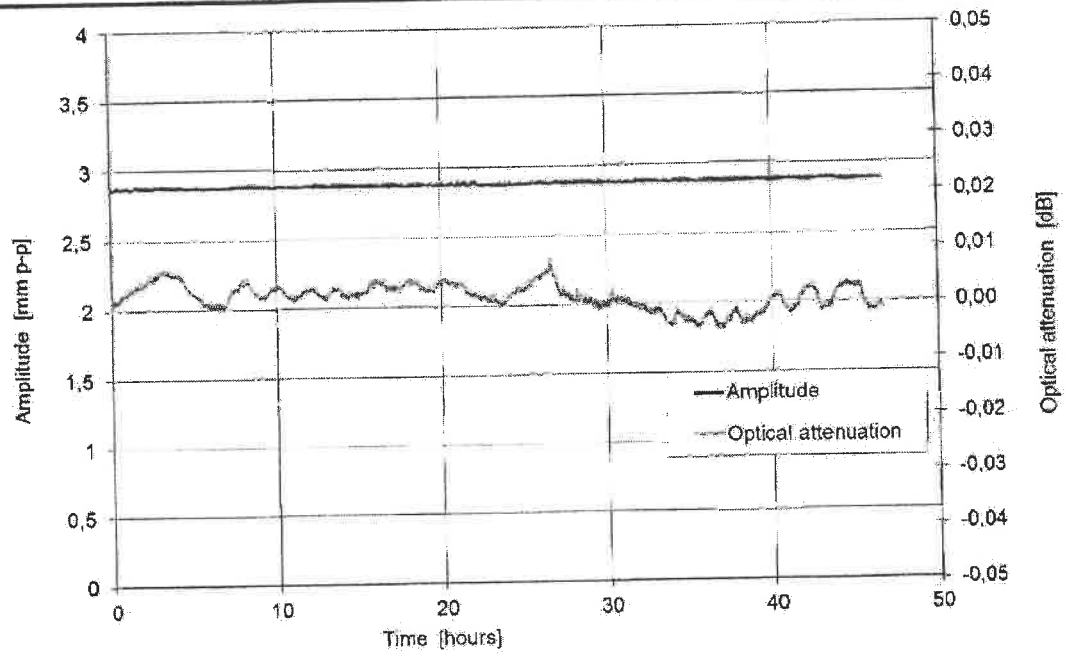


Figure 2: Diagram amplitude and optical attenuation vs time

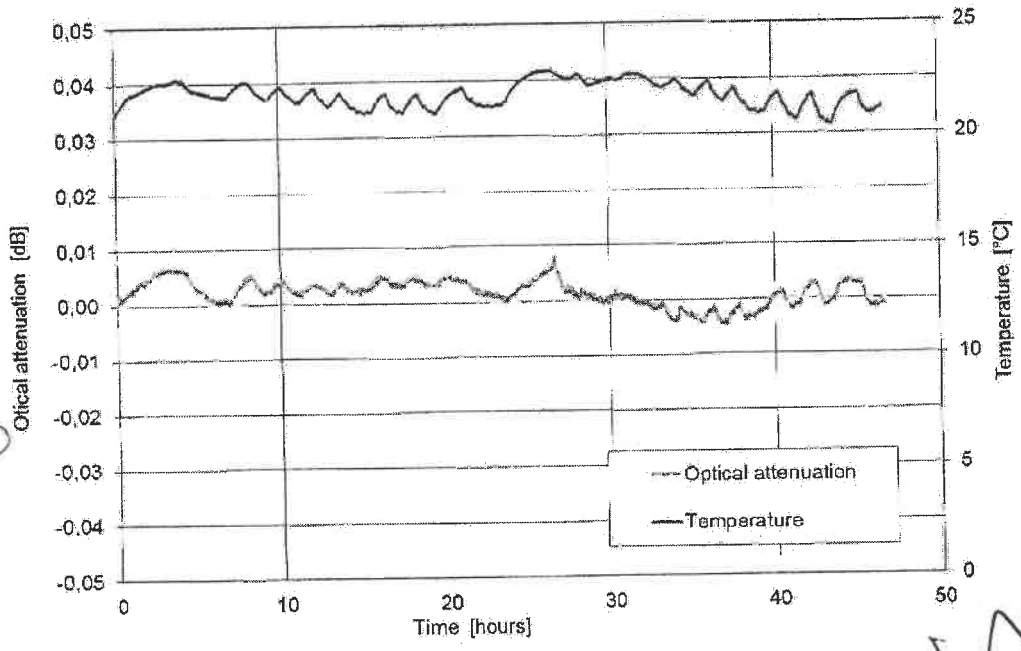


Figure 3: Diagram optical attenuation and ambient temperature vs time

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date 28+30.04.11
DE - 0025

Appendix 2: Photographs

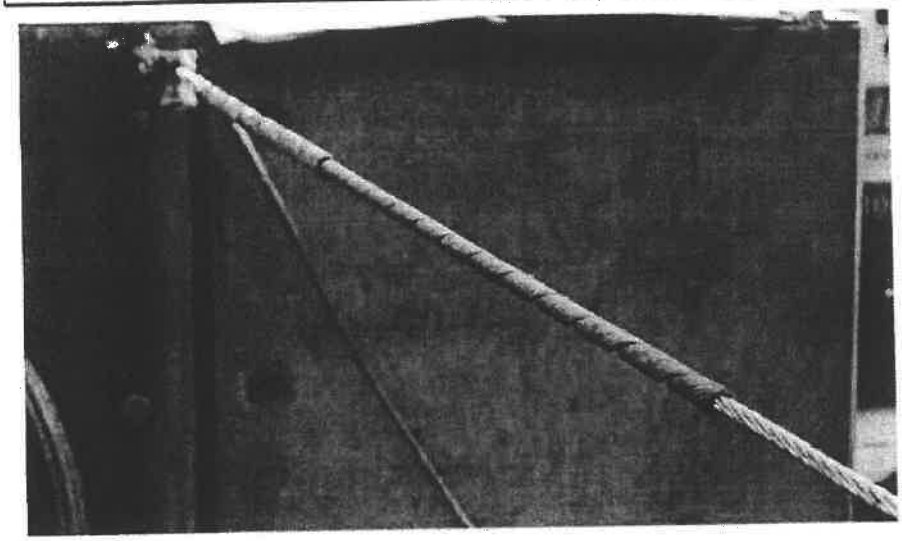


Figure 1: Termination of passive span

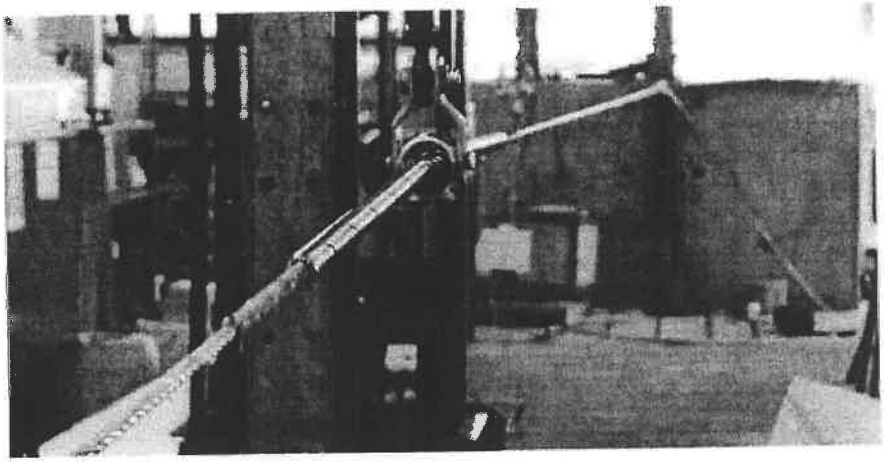


Figure 2: Suspension point, view toward passive span

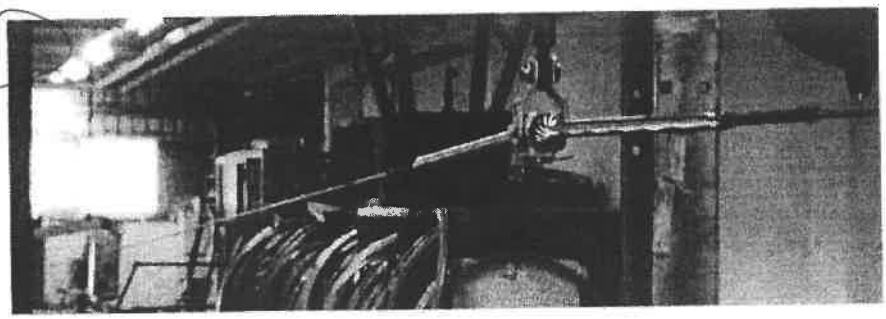


Figure 3: Suspension point, view toward active span

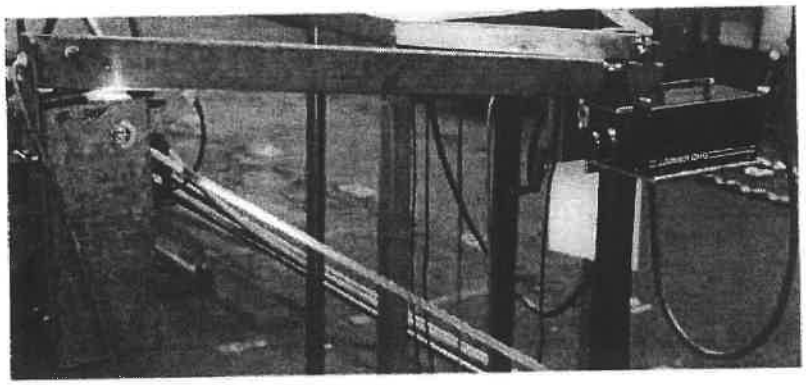


Figure 4: Non-contact optical displacement sensor

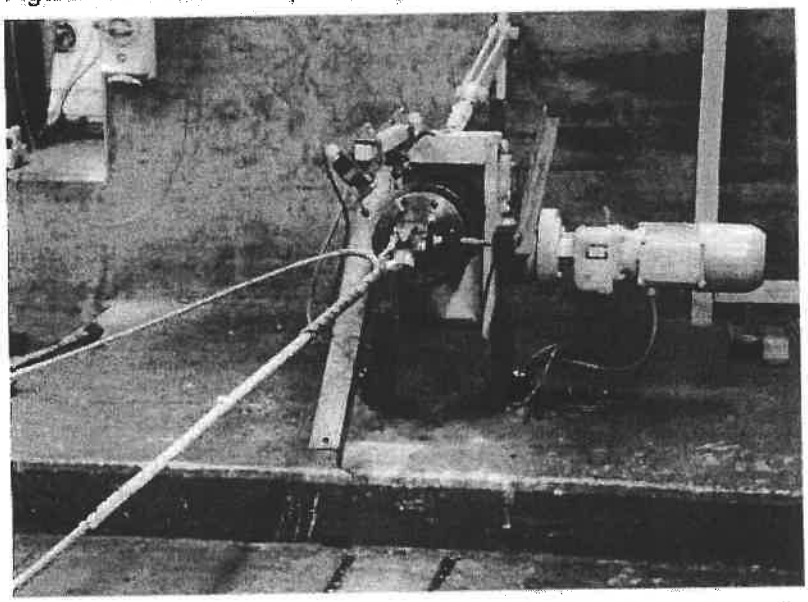


Figure 5: Termination of active span, constant tension device with load cell

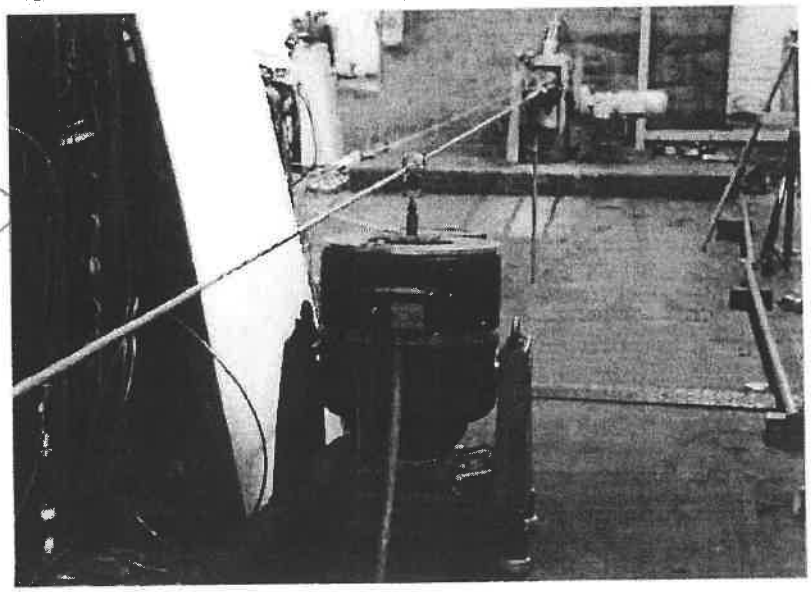


Figure 6: Vibration shaker, view toward constant tension device

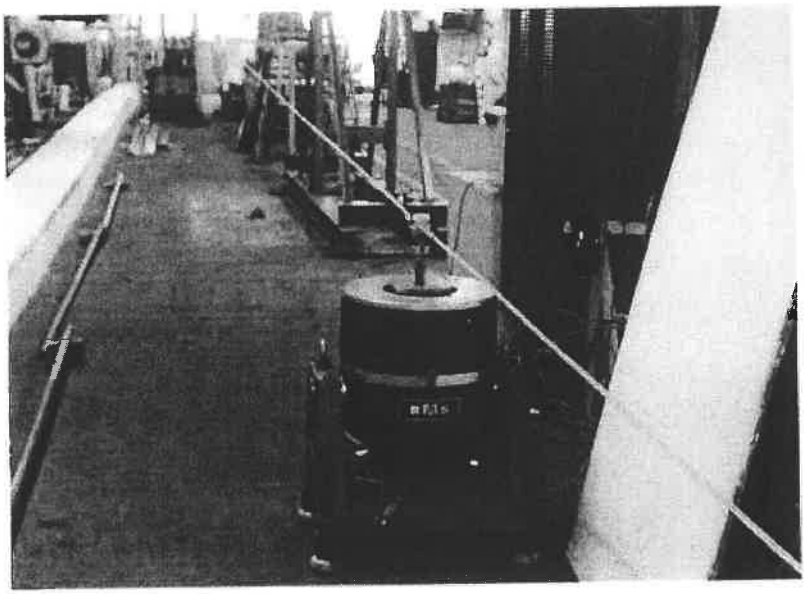


Figure 7: Vibration shaker, view toward constant tension device

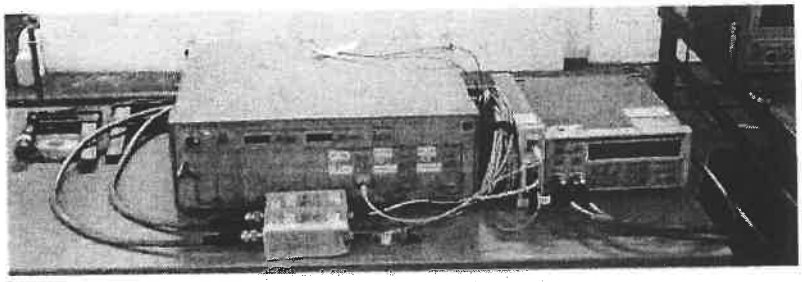


Figure 8: Device for measurement of optical power.

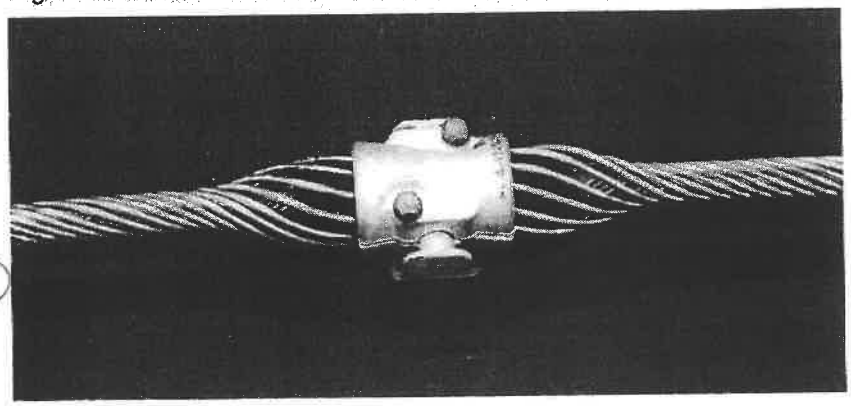


Figure 9: Suspension clamp after test, no damage.

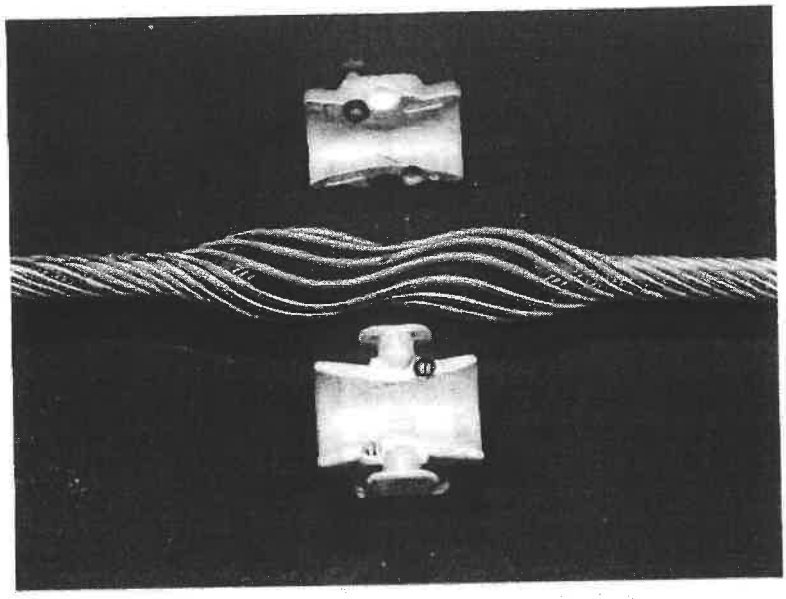


Figure 10: After test, clamp housing taken off, no damage.

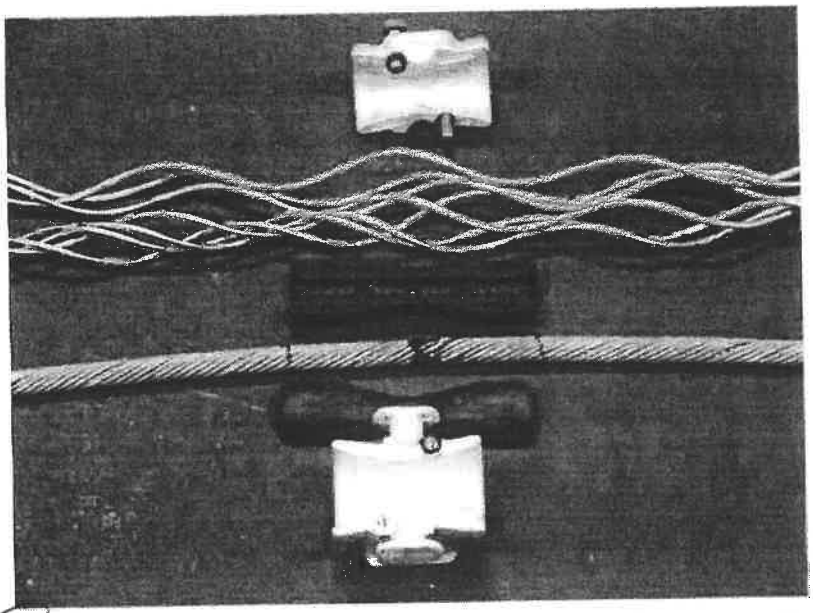


Figure 11: After test, view on protection rods on cable, armour rods and neoprene inserts taken off, no damage.

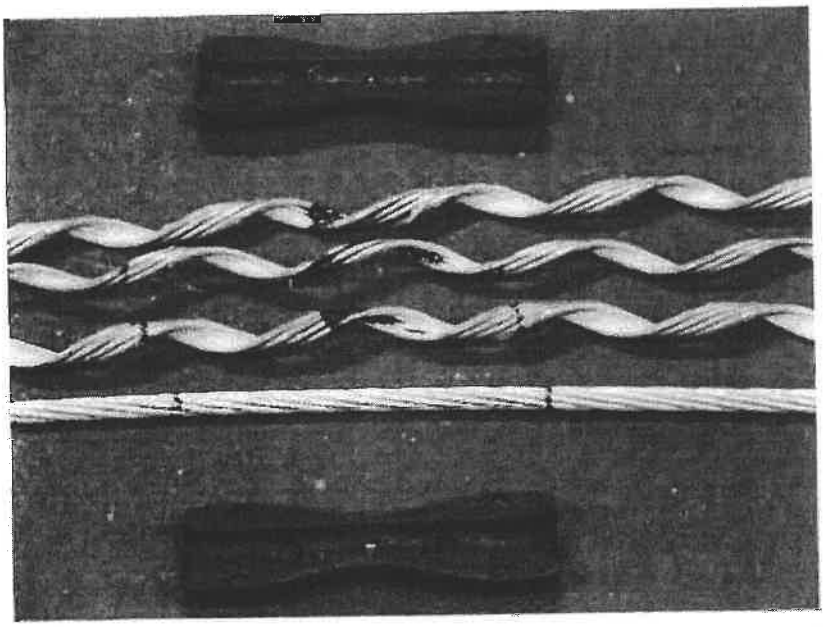


Figure 12: After test, protection rods taken off, view on cable, no damage.

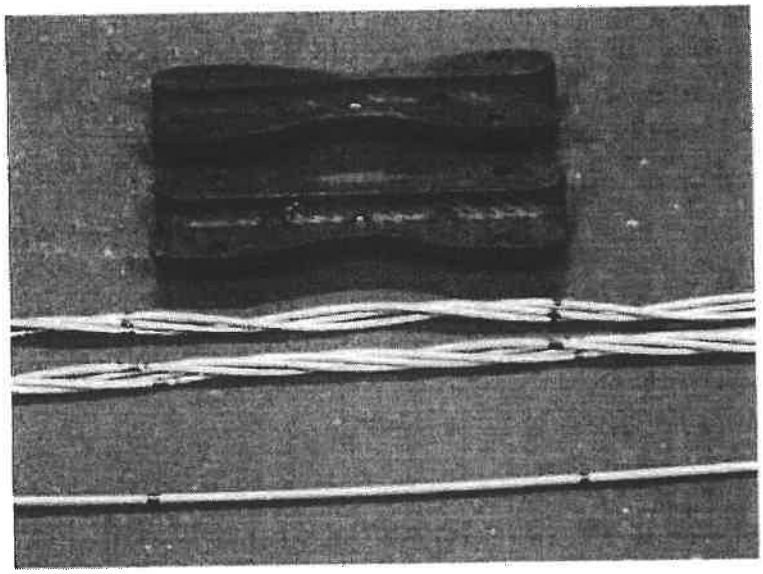


Figure 13: After test, outer wires taken off, view on stainless steel tube (bottom of the picture), no damage.

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 30.04.11

Заличено по чл. 36а, ал.3 от ЗОП

Appendix 3: Certificate of Quality Management System

CERTIFICATE

TÜV NORD

Management system as per
DIN EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures it is hereby certified that

Richard Bergner Elektroarmaturen GmbH & Co. KG
Bahnhofstraße 8 - 16
91126 Schwabach
Germany

with the places
Schwabach and Radebeul

applies a management system in line with the above standard for the following scope

Fittings and engineering services for electrical power industry, catenary wire systems, telecommunication appliance and substation clamps

Certificate Registration No. 04 100 930150
Audit Report No. 3004 0946

Valid until 2012-07-29
Initial certification 1995

Заличено по чл. 36а, ал.3 от ЗОП

Certification Body
at TÜV NORD CERT GmbH

Essen, 2009-07-30

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

TÜV NORD CERT GmbH Langemarckstrasse 20 45141 Essen www.tuev-nord-cert.com

IAF

MOODY INTERNATIONAL
Reviewed
Witnessed
Date 05.07.11

Заличено по чл. 36а, ал.3 от ЗОП

Appendix 4: Load cell 200 kN

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

EML Schwabach den 17.03.2011

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zer101_18 **Seitenanzahl:** 2
Gültigkeitsdauer: 12 Monate

Die Kalibrierung wurde entsprechend der zugehörigen Arbeitsanweisung "Arb101_3" durchgeführt

Gegenstand der Kalibrierung:
Seilzugkraftmeßkette des Prüfstandes Spur 2 im Innenraumschwingungsstand, bestehend aus:

Geräte:	Zugkraftaufnehm.;	Meßverstärker;
Type:	K 11;	IMS;
Hersteller:	LORENZ;	LORENZ;
Seriennr.:	28261;	ohne;
Sonstiges:		Kalibrierwert-anzeige

Referenzmeßkette:

Geräte:	Kraftaufnehmer;	Meßverstärker;
Type:	U2A (XM001);	MC55 (AB12);
Hersteller:	HBM;	HBM;
Seriennr:	F 18511;	ohne;
Genauigkeitskl.	0,1;	Referenzwert-anzeige

Einzelheiten der Referenzmeßkette sind im gültigen Kalibrierschein Nr.: **FL 885 HBM 2009-9** der Firma HBM vom 07.09.2009 beschrieben, die Kalibrierung ist im Sinne der DIN EN ISO 9001 und DIN ISO 10012, Teil 1 auf nationale Normale rückführbar.

Meßwerte: siehe Rückseite **Prüfdatum:** 09.03.2011

Prüfer: Jung / Heinl **Unterschrift:** Jung

MOODY INTERNATIONAL
☑ Reviewed
☐ Witnessed
Date 05.05.11

Appendix 5: Non-contact displacement sensor

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

EKL Schwabach den 02.06.2010

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zert_Opt25 **Seitenanzahl:** 2

Die Kalibrierung wurde entsprechend der zugehörigen Arbeitsanweisung "Arbeitsanweisung 9/5." durchgeführt.

Gegenstand der Kalibrierung: Elektro-optische Wegmeßer Meßbereich +/- 25 mm, im Innenraumschwingungsstand.

Geräte:	Hersteller:
Geräte:	Wegmesser:
Type:	Ysaron 100B / 101B;
Hersteller:	Rodenstock; Zimmer;
Seriennr.:	100-5 / 1270

Referenzmeßkette:

Geräte:	Hersteller:	Type:	Seriennr.:	Sonstiges:	Gültiger Kalibrierschein:
a - Aufnehmer	Kistler	8702B25M1	C192799	-	857/2010
Analysator	Hewlett&Packard	35665 A	3046 A 00173	Prog.-gesteuert	1-2401338431-1
Kal. Programm	RIBE-	Kalib_25_Opt	-	Referenzanz.	

Einzelheiten der Referenzmeßkette sind in den aufgeführten Kalibrierscheinen beschrieben.

Meßwerte: siehe Rückseite **Prüfdatum:** 02.08.2010

Prüfer: Krispin / Jung

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date 05.05.11

Richard Bergner Elektroarmaturen GmbH & Co. KG is certified by TÜV NORD CERT GmbH in accordance with DIN EN ISO 9001, certificate registration No. 04 100 950 150.

A quality management system in accordance with DIN EN ISO 9001 ensures a continuous inspection of measuring and test equipment. Reference standards traceable to national standards are available.

Richard Bergner Elektroarmaturen GmbH & Co. KG is a certified supplier of the Chinese „Ministry of Railways" (MoR).

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier by Sellihca Nordic Utility Pre-Qualification System with registration No.101109.

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of ADWEA, PCGIL and ESKOM.

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of E.ON AG, RWE AG and Vattenfall Europe AG for high voltage OHTL fittings, fittings for fibre optic cables and for damping systems.

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of Deutsche Bahn AG, Nederlandse Spoorwegen and Österreichischen Bundesbahnen AG.

TÜV NORD
TÜV NORD CERT GmbH
DIN EN ISO 9001
Freiwillige Zertifizierung

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date 05.05.11

RIBE ELEKTROARMATUREN

Schwabach - Radebeul

Schwabach, 28 April 2011

PROTOCOL

Termination of test on OPGW

At the request of: **AFL Telecommunications GmbH**

Project: **Saudi Electricity Company SEC**
Saudi Arabia

The following test:

Test	OPGW
Aeolian Vibration Test	ASLH-D(S)b 36 SMF (A20SA 37 – 2,9)

was started in the presence of the persons named below.

The test procedure was found to be in order. The test results will be documented in a final detailed report.

Mr Saeed Hamad Al Kahtani / SEC
Mr Majid Abdulrahman Al Suhibani
Mr Abdulaziz Abdulrahman Al Hag
Mr Norbert Zimmermann / Moody
Mr Heribert Mühlen / AFL
Mr Carl-Magnus Kyrklund / AFL

Заличено по чл. 36а, ал.3 от ЗОП

Dr. Mario Dansachmüller / RIBE

Заличено по чл. 36а, ал.3 от ЗОП

Annexes

Annex 1 Aeolian Vibration Test

Test standard:	IEC 60794-1-2-E19:2003 / 10-TMSS-04, rev. 0; 5.1.1e
Measurement devices:	Load cell 200 kN, Lorenz K11, S. No. 28261 (calibration certificate see annex 3) Optical Power Meter Anritsu ML 910A
Test requirements:	Increase of attenuation 1550 nm ≤ 1,0 dB/test fibre km; no damage of cable components.

Protocol

Annex 2 ISO 9001 Certificate

CERTIFICATE TÜV NORD

Management system as per
DIN EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

Richard Bergner Elektroarmaturen GmbH & Co. KG
Bahnhofstraße 8 - 16
91126 Schwabach
Germany

with the places
Schwabach and Radebeul

[illegible]

Fittings and engineering services for electrical power industry, catenary wire systems, telecommunication appliance and substation clamps

[illegible] Validated 2012-07-25
[illegible]

Заличено по чл. 36а, ал.3 от ЗОП

[illegible] Issue: 2009-07-30
[illegible]

[illegible]

[illegible]

Annex 3 Load cell 200 kN

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

EML Schwabach den 17.03.2011

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zer101_18 **Seitenanzahl:** 2
Gültigkeitsdauer: 12 Monate

Die Kalibrierung wurde entsprechend der zugehörigen Arbeitsanweisung "Arb101_3" durchgeführt

Gegenstand der Kalibrierung:

Seilzugkraftmeßkette des Prüfstandes Spur 2 im Innenraumschwingungsstand, bestehend aus:

Geräte:	Zugkraftaufnehm.;	Meßverstärker;
Type:	K 11;	IMS;
Hersteller:	LORENZ;	LORENZ;
Seriennr.:	28261;	ohne;
Sonstiges:		Kalibrierwert-anzeige

Referenzmeßkette:

Geräte:	Kraftaufnehmer;	Meßverstärker;
Type:	U2A (XM001);	MC55 (AB12);
Hersteller:	HBM;	HBM;
Seriennr:	F 18511;	ohne;
Genauigkeitskl.	0.1;	Referenzwert-anzeige

Einzelheiten der Referenzmeßkette sind im gültigen Kalibrierschein Nr.: **FL 886 HBM 2009-9** der Firma HBM vom 07.09.2009 beschrieben, die Kalibrierung ist im Sinne der DIN EN ISO 9001 und DIN ISO 10012, Teil 1 auf nationale Normale rückführbar.

Meßwerte: siehe Rückseite **Prüfdatum:** 09.03.2011

Prüfer: Jung / Heinl **Unterschrift:**

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

Seite 2 zum Prüfzeugnis vom 09.03.2011

Meßwerte untariert mit dem Kalibrierwerten 63 und 9655 gemessen:

Referenz-wertanzeige [kN]	Kalibrierwertanzeige steigend [kN]	Abweichung [%]	fallend [kN]	Abweichung [%]
0	0,00	0,00	0,00	0,00
5	5,00	0,00	4,98	-0,40
10	9,90	-1,00	9,90	-1,00
20	19,84	-0,80	19,86	-0,70
30	29,84	-0,53	29,86	-0,47
40	39,90	-0,25	39,88	-0,30
50	49,86	-0,28	49,86	-0,28
60	59,92	-0,13	59,90	-0,17
70	69,90	-0,14	69,98	-0,03
80	79,96	-0,05	80,00	0,00
90	90,00	0,00	90,12	0,13
100	100,30	0,30	99,98	-0,02
Belastung mit	Seil-Ø 20[mm]		Seil-Ø 20[mm]	
Umgebung	21		21	
Abweichung vom		-0,16		-0,14
Kalibrierendwert		0,30		0,12
zul. Fehlergrenze		± 1,00		± 1,00

Bei zukünftigen Messungen sind die neuen Kalibrierwerte 63 und 9655 zu benützen.

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

zu Kallbrierschein: Zer101_18

Seite 3 zum Prüfzeugnis vom 09.03.2011

Meßwerte untariert mit dem Kallbrierwerten 63 und 9655gemessen:

Spiderein-stellung	Kanal 1 100 Hz	Spannung 10 V Filter Variable bester Zeitverlauf 10 Hz Verstärker 0.002 mV/V		Delphin-Gerät	10V = 200 kN		
Spider steigend	Abweichung [%]	Spider fallend	Abweichung [%]	Delphin steigend	Abweichung [%]	Delphin fallend	Abweichung [%]
0,00	0	0	0	0		0,06	
5,05	1,00	5,05	1,00	5,02	0,40	5,01	0,20
10,02	0,20	10,064	0,64	9,99	-0,10	10,04	0,40
20,04	0,20	20,152	0,76	19,98	-0,10	20,11	0,55
30,12	0,40	30,136	0,45	29,95	-0,17	30,13	0,43
40,1	0,25	40,16	0,40	39,95	-0,13	40,13	0,33
50	0,00	50,176	0,35	49,9	-0,20	50,09	0,18
60,05	0,08	60,184	0,31	59,95	-0,08	60,26	0,43
70,05	0,07	70,184	0,26	69,95	-0,07	70,24	0,34
80,1	0,12	80,28	0,35	79,96	-0,05	80,27	0,34
90,1	0,11	90,376	0,42	90,05	0,06	90,35	0,39
100,456	0,46	100,56	0,56	100,3	0,30	100,45	0,45
St-Seil-Ø 20[mm]		St-Seil-Ø 20[mm]			St-Seil-Ø 20[mm]		
21		21				21	
	0,00		0,00		-0,10		0,01
	0,00		0,56		0,30		0,45
	± 1,00		± 1,00		± 1,00		± 1,00

Bei zukünftigen Messungen sind die neuen Kallbrierwerte 63 und 9665 zu benützen.

Protocol

Annex 4 Electro-optic displacement sensor

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

EKL

Schwabach den 02.08.2010

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zert_Opt25 **Seitenanzahl:** 2

Die Kalibrierung wurde entsprechend der zugehörigen Arbeitsanweisung "Arba..." durchgeführt.

Gegenstand der Kalibrierung: Elektro-optische Wegmeßer Meßbereich +/- 25 mm, im Innenraumschwingungsstand.

Geräte:	Hersteller:
Geräte:	Wegmesser;
Type:	Ysaron 100B / 101B;
Hersteller:	Rodenstock; Zimmer;
Seriennr.:	100-5 / 1270

Referenzmeßkette:

Geräte:	Hersteller:	Type:	Seriennr.:	Sonstiges:	Gültiger Kalibrierschein:
a - Aufnehmer	Kistler	8702B25M1	C192799	-	857/2010
Analysator	Hewlett&Packard	35665 A	3046 A 00173	Prog.-gesteuert	1-2401338431-1
Kal. Programm	RIBE-	Kalib_25_Opt	-	Referenzanz.	

Einzelheiten der Referenzmeßkette sind in den aufgeführten Kalibrierscheinen beschrieben.

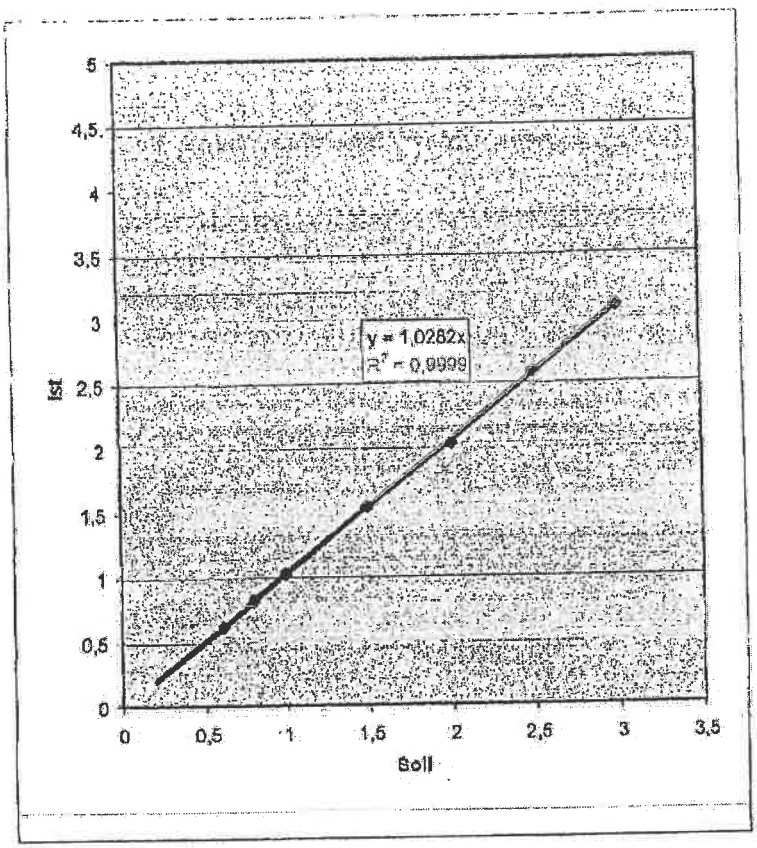
Meßwerte: siehe Rückseite **Prüfdatum:** 02.08.2010

Prüfer: Krispin / Jung

Заличено по чл. 36а, ал.3 от ЗОП

Protocol

Electro-optic displacement sensor: calibration measurement data



f	50	Hz			
Weg Soll [mm]	Beschleunigung Soll [m/s²]	Beschleunigung Ist [m/s²]	Weg soll [mm]	Weg Ist [mm]	Weg * Faktor [mm]
0,2					
0,4					
0,6	59,22	59,16	0,600	0,617	0,610
0,8	78,96	78,66	0,797	0,819	0,810
1,0	98,70	98,52	0,998	1,027	1,016
1,5	148,04	147,52	1,495	1,540	1,523
2,0	197,39	197,07	1,997	2,040	2,018
2,5	246,74	246,23	2,495	2,680	2,552
3,0	296,08	295,46	2,993	3,090	3,056

Optik 25 Filterfrequenz 1 k

Faktor: **0,989**

Zukünftig ist mit den Kalibrierfaktor **0,989** zuarbeiten

Creep Test

Annex 11

Cable type:	ASLH-D(S)B 36 SMF (A20SA 37 – 2,9)
Cable product spec.:	TK 10471/10-03
Cable-ID:	10283527/6735
Test procedure:	IEC 61395

Measurement devices: Creep Test bench

Test conditions:		
	test length:	min. 10m
	test load:	30% RTS
	test duration:	min. 1000h

Requirements: (record of strain vs. time)

Results: strain vs. time was recorded
see report of independent laboratory
(400h under test; test is continuing up to 1400h)

RIBE ELEKTROARMATUREN

Schwabach - Radebeul

Schwabach, 28 April 2011

PROTOCOL

Termination of test on OPGW

At the request of: **AFL Telecommunications GmbH**

Project: **Saudi Electricity Company SEC**
Saudi Arabia

The following test:

Test	OPGW
Creep Test	ASLH-D(S)b 36 SMF (A20SA 37 – 2,9)

was inspected in the presence of the persons named below.

The test procedure and the preliminary results were found to be in order. The test was decided to run for another 1000 h from the time of inspection. The test results will be documented in a final detailed report.

Mr Saeed Hamad Al Kahtani / SEC
Mr Majid Abdulrahman Al Suhibani /
Mr Abdulaziz Abdulrahman Al Hagba
Mr Norbert Zimmermann / Moody
Mr Heribert Mühlen / AFL
Mr Carl-Magnus Kyrklund / AFL

Заличено по чл. 36а, ал.3 от ЗОП

Dr. Mario Dansachmüller / RIBE

Заличено по чл. 36а, ал.3 от ЗОП

Annexes

Annex 1 Creep Test

Test standard:	IEC 61395:1998 (30% RTS;1000h)/ 10-TMSS-04, rev. 0; 5.1.1h
Measurement devices:	Load cell 100 kN, Lorenz K11, S. No. 48070 (calibration certificate see Annex 3) Displacement sensor HBM WA 50 mm, S. No. 82810077 Displacement sensor HBM WA 20 mm, S. No. 34910147 (calibration certificate see Annex 4)
Test requirements:	A linear regression shall be made using the values between 1 h and 1000 h to calculate the creep equation. The constants a and b shall be presented in the report, together with nominal agreed temperature variation. A log-log diagram shall be made with elongation versus time up to 100000 h with the fitted straight line plotted together with the nominal and average temperatures and actual temperature variation

Annex 2 ISO 9001 Certificate

CERTIFICATE

TÜV NORD

Management system as per
DIN EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures it is hereby certified that

Richard Bergner Elektroarmaturen GmbH & Co. KG
Bahnhofstraße 8 - 16
91126 Schwabach
Germany

with the places
Schwabach and Radebeul

[illegible]

Fittings and engineering services for electrical power industry, catenary wire systems, telecommunication appliance and substation clamps

Certificate Registration No. [illegible]
Audit Report No. [illegible]

Valid until: 2012-07-15
[illegible]

Заличено по чл. 36а, ал.3 от ЗОП

[illegible]
Cert. Validation Body
at TÜV NORD CERT GmbH

Essen, 2009-07-30

[illegible]

TÜV NORD CERT GmbH [illegible] [illegible] www.tuv-nord-cert.com

IAF

Annex 4 Load cell 100 kN

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG

EKL Schwabach den 09.03.2011

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zer102_18 **Seitenanzahl:** 2
Gültigkeitsdauer: 12 Monate

Die Kalibrierung wurde entsprechend der zugehörigen Arbeitsanweisung "Arb102_2" ausgeführt.

Gegenstand der Kalibrierung:

Seilzugkraftmeßkette des Prüfstandes Spur 3 im Innenraumschwingungsstand, bestehend aus:

Geräte:	Zugkraftaufnehm.;	Meßverstärker;
Type:	K 11;	PAX S;
Hersteller:	LORENZ;	LORENZ;
Serienn.:	48070;	7524;
Sonstiges:		Kalibrierwert-anzeige

Referenzmeßkette:

Geräte:	Kraftaufnehmer;	Meßverstärker;
Type:	U2A (XM001);	MC55 (AB12);
Hersteller:	HBM;	HBM;
Serienn:	F 18511;	ohne;
Genauigkeitskl.	0.1;	Referenzwert-anzeige

Einzelheiten der Referenzmeßkette sind im gültigen Kalibrierschein Nr.: **FL885 HBM 2009-09** der Firma HBM vom **2009-09-07** beschrieben, die Kalibrierung ist im Sinne der DIN EN ISO 9001 und DIN ISO 10012, Teil 1 auf nationale Normale rückführbar.

Meßwerte: siehe Rückseite **Prüfdatum:** 09.03.2011

Prüfer: Jung / Heinl **Unterschrift:**

Заличено по чл. 36а, ал.3 от ЗОП

Annex 5 Electro-mechanical displacement sensors

RIBE Richard Bergner Elektroarmaturen GmbH + Co KG

EKL

Schwabach, den 21.03.2011

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zert125_18 **Seitenanzahl:** 3
Gültigkeitsdauer: 12 Monate

Die Kalibrierung wurde entsprechend der Arbeitsanweisung " 126/1 " durchgeführt.

Gegenstand der Kalibrierung: Beide Wegtaster für getrennte Wegmessungen, Taster B mit 25[m] Verlängerungskabel.

Meßkette für Kriechdehnungsmessungen an Seilen und Kabeln bis 200[kN], bestehend aus:

	Wegtaster A	Wegtaster B	Verstärker
Geräte:	WA 50 mm	WA 20 mm	SPIDER
Type:	HBM	HBM	HBM
Hersteller:	82810077	40710321	-
Seriennr.:	0,1	0,1	0,1
Genauigkeitskl.:	6-Leiter	6-Leiter	
Sonstiges:			

Referenzmaße:

	Endmaßsatz	Haltevorrichtung
Geräte:	-	-
Type:	C.Johansson	RIBE
Hersteller:	11	-
Seriennr:	1 bei 20°	-
Genaulgkeitskl.:	DKD - 17301	-
Sonstiges:		

Einzelheiten der Referenzendmaße sind im gültigen Kalibrierschein vom 21.6.2005 beschrieben. Die Kalibrierung ist im Sinne der DIN EN ISO9001 und DIN ISO 10012, Teil 1 auf nationale Normale rückführbar.

Meßwerte: siehe Rückseite **Prüfdatum:** 21.03.2011

Prüfer: Jung / Heinl **Unterschrift:**

Заличено по чл. 36а, ал.3 от ЗОП

RIBE ELEKTROARMATUREN
Schwabach - Radebeul

Test Report
VE-K 8786e

Devices under Test: Creep Test on Optical Ground Wire ASLH-D(S)b 36 SMF (A20SA 37 – 2,9) - dia. 8,6 mm manufactured by AFL Telecommunications

Creep Test	File: 1.7

Client: AFL Telecommunications GmbH

Applied Specification: IEC 61395 / 10-TMSS-04, rev. 0; 5.1.1h

Contents: 13 pages

Summary:
According IEC 61395 a creep test with an ASLH-D(S)b 36 SMF (A20SA 37 – 2,9) - dia. 8,6 mm was carried out.

Result:
The creep behavior of the conductor was determined as

$$\varepsilon_c = 0.00703187 \times t^{0.158667},$$

where ε_c is the creep strain in % and t is time in hours.

The calculated long time creep for ten years (=87600 hours) is 0.0428 %.

Stefan Halbig
Development Engineer

Mario Dansachmüller
Test Engineer

Schwabach, 15th June,2011

Accreditation:

The quality management system of Richard Bergner Elektroarmaturen GmbH & Co. KG is certified by TÜV NORD CERT GmbH in accordance with DIN EN ISO 9001:2008, certificate registration No. 04 100 950 150.

Adresses:

Manufacturer:	AFL Telecommunications GmbH Bonnenbroicher Str. 2-14 41238 Mönchengladbach, Germany
Customer:	AFL Telecommunications GmbH Bonnenbroicher Str. 2-14 41238 Mönchengladbach, Germany
Test laboratory:	RIBE Test Laboratory Werk 2 Industriestr. 4 91126 Schwabach, Germany

MOODY INTERNATIONAL
☐ Reviewed
☒ Witnessed
Date: 28.04 - 15.06.19
DE - 8038

Заличено по чл. 36а, ал.3 от ЗОП

Contents

This report consists of
Pages (in total) 13

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Date 28.04 to 15.06.11

Заличено по чл. 36а, ал.3 от ЗОП

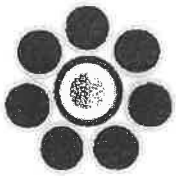
1. Drawings

AFL Telecommunications
A Fujikura Business

18.10.2010, WS,
1201 28200300-96421672S TK 10471/10-03

ASLH-D(S)-36 SMF (A20SA 37 - 2,9)

Optical Ground Wire (OPGW) according to EN 60794-4 standards



- Stranding direction of outer layer: right hand (Z-stranding)
- Wires acc. to EN 61232
- Maximum fibre capacity per steel tube: 36
- Fibres coloured acc. to colour code system 036 F SEC
- Fibres acc. to G.652
- Impregnated wooden drum with protection

Configuration

Center	1 Stainless Steel Tube with 36 SMF *Stainless steel tube material:* *DIN EN 10088-02, Mat. No. 1.4404*	2,90 / 3,40 mm
Layer 1	7 A20SA - Wires	2,60 mm

Mechanical Data

Cable Diameter		8,6 mm
Cable Weight		275 kg/km
Supporting Cross Section		37,2 mm²
Rated Tensile Strength (RTS)		47,3 kN
Ratio RTS / Cable Weight		17,5 km
Modulus of Elasticity		162,0 kN/mm²
Thermal Elongation Coefficient		13,0 10^{-6}/K
Permissible Maximum Working Stress (42% RTS)		534,7 N/mm² (19,9kN)
Recommended Everyday Stress (16% RTS)		203,7 N/mm² (7,6kN)
Ultimate Exceptional Stress (72% RTS)		916,6 N/mm² (34,1kN)

Electrical Data

DC Resistance (20°C)		2,325 Ω/km
Conductivity		20,0% IACS
Short Time Current	(1,0s, 50-200°C)	2,9 kA
Short Time Current	(0,3s, 50-200°C)	5,3 kA
Short Time Current Capacity I²t	(50-200°C)	8,3 kA²s

Application

Maximum Permissible Installation Force		14,2 kN
Minimum Bending Radius	static	108 mm
	dynamic	129 mm
Normal Delivery Length		4000 m
Temperature Range	Installation	-10 to +50°C
	Transportation and Operation	-40 to +80°C

All Sizes and Values are Nominal Values ongw_pro8.xls, Rev. 12.02

www.aftele.com AFL Telecommunications GmbH

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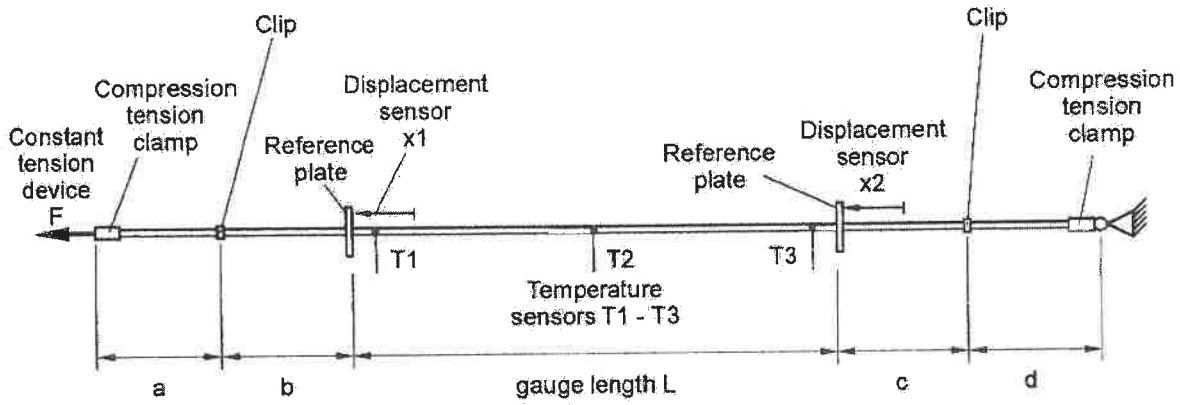
DE - 0036

2. Description of the test and results

2.1. Set-up for the Creep Test

Figure 1 shows the general test arrangement.



Sample length: 40.63 m
Gauge length L: 30.06 m
a / d 2.72 m / 2.67 m
b / c 2.49 m / 2.51 m

Figure 1: Arrangement of the Creep Test

Compression type end fittings were used. Additionally, bolted clips were applied to prevent slippage and interlayer movement. The grooves of the clips had the same diameter as the cable to keep the sample perfectly concentric.
Displacements x1 and x2 were measured with two inductive displacement sensors (LVDT - Linear Variable Differential Transformer, measurement range 20 mm and 50 mm, accuracy 0.2 %). Total strain was determined as $\varepsilon_{total} = (x1 - x2)/L$, with gauge length L.
The conductor temperature was measured in the middle (T2) and at both ends (T1 and T3) of the gauge length, during the test. Thermocouples (type T, copper-constantan) were used with an accuracy better than ±0.5°C.
The test tension was kept constant at 14.2 kN (corresponding to a tensile stress of 382 N/mm² or 30.0 % RTS) within ±1.0% by means of a constant tension device. The tension was measured with a calibrated load cell (accuracy < 0.5%) and continuously monitored during the test.

2.2.Start-end of test

The creep test was started on 11th April 2011, 10:30, and officially restarted on 28th April 2011, for another 1000 h. The creep test was officially terminated on 15th June 2011, 9:30, after 1560 h.

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Date: 28.04 - 15.06.11

2.3. Results of the Creep Test

The temperatures T1, T2 and T3 were measured during the test time and yields the mean temperature Ta=(T1+T2+T3)/3. The minimum average temperature Ta during the test was 19.8 °C and the maximum average temperature was 21.8 °C. Figure 3 shows the temperatures during the test. The tension force during the test is shown in Figure 2.

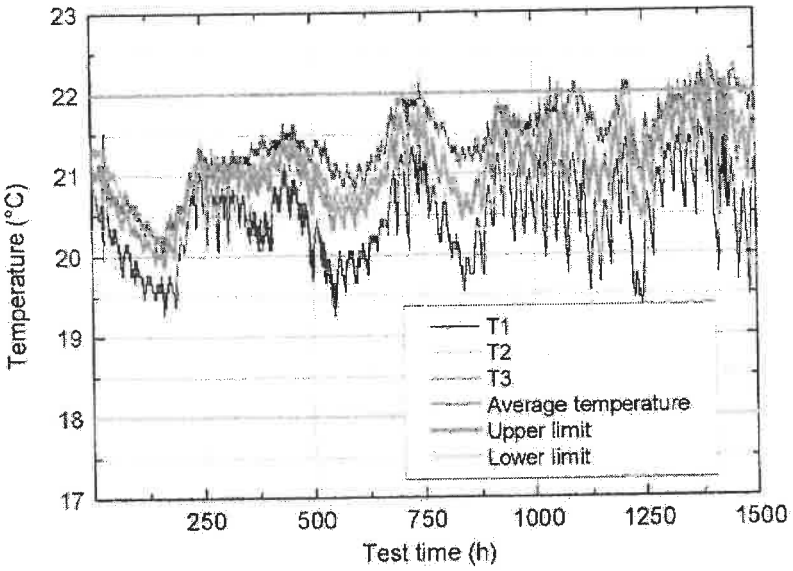

Figure 2: Measured temperatures during the test

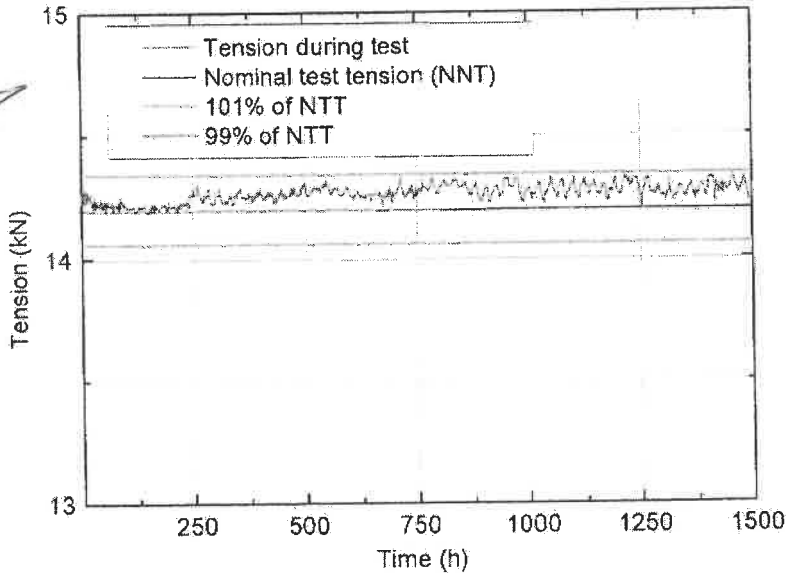

Figure 3: Tension during the creep test

3 Results

Table 1 gives the readings during the test. Temperature variations of strain were compensated by calculating the thermal strain variation $\varepsilon_{thermal} = \alpha \cdot (\vartheta - \vartheta_0)$, where α is the coefficient of thermal elongation (13 x 10^{-6} 1/K as per data sheet), ϑ is the temperature at the time of data reading and ϑ_0 is the temperature at start of the measurement. The average of temperatures Ta was used. Creep strain ε_c was determined by subtracting thermal strain from measured total strain.

A linear regression was made using the values between 1 hour and 1000 hours to calculate the coefficients of the creep equation:

$$\varepsilon_c = a \times t^b ,$$

where ε_c is the creep strain in % and t is time in hours.

The following coefficients were determined:

a = 0.00703187

b = 0.158667

Calculated long time creep for 10 years (=87600 hours) is 0.0428%.

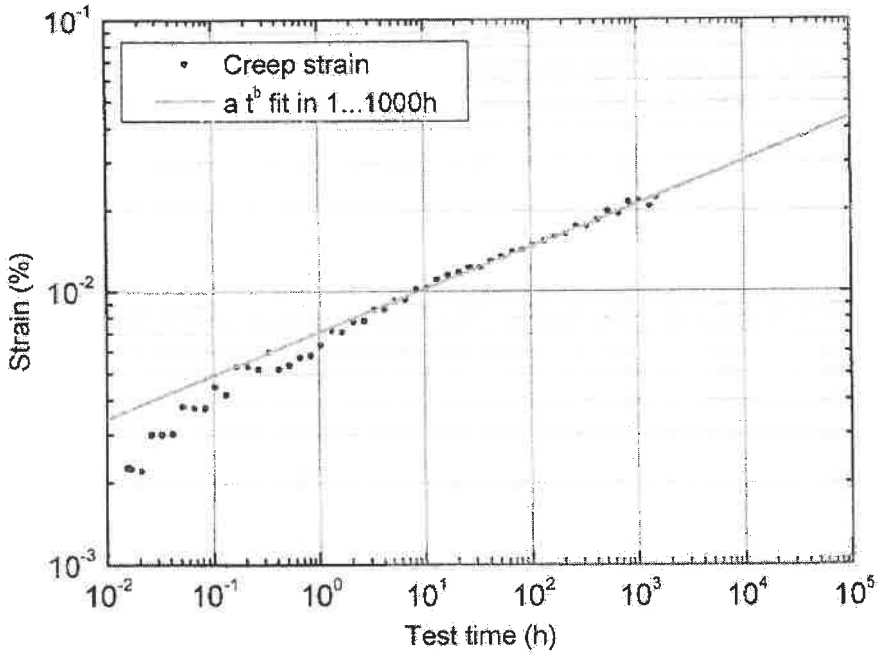

Figure 4: Measured creep strain and best fit straight line

Table 1: Readings of the Creep test

Time [h]	T1 [°C]	T2 [°C]	T3 [°C]	Ta [°C]	Total strain [%]	Thermal strain [%]	Creep strain [%]
0.016	20.4	20.9	20.3	20.7	0.00226	0	0.00226
0.016	20.4	20.9	20.3	20.7	0.00227	0	0.00227
0.016	20.4	20.9	20.3	20.7	0.00226	0	0.00226
0.017	20.4	20.9	20.4	20.7	0.00227	0.00003	0.00224
0.021	20.5	20.9	20.4	20.7	0.00226	0.00006	0.00219
0.026	20.5	20.9	20.4	20.7	0.00304	0.00006	0.00298
0.033	20.5	20.9	20.4	20.7	0.00304	0.00006	0.00298
0.042	20.5	20.9	20.4	20.7	0.00304	0.00003	0.00300
0.053	20.5	20.9	20.4	20.7	0.00381	0.00003	0.00378
0.066	20.5	21.0	20.4	20.8	0.00382	0.00010	0.00372
0.083	20.5	21.0	20.4	20.8	0.00382	0.00010	0.00372
0.105	20.5	20.9	20.5	20.8	0.00455	0.00010	0.00445
0.132	20.5	20.9	20.5	20.8	0.00436	0.00019	0.00417
0.166	20.5	21.0	20.5	20.8	0.00538	0.00010	0.00528
0.209	20.6	21.1	20.5	20.8	0.00539	0.00013	0.00526
0.264	20.6	21.1	20.6	20.9	0.00538	0.00023	0.00515
0.332	20.6	21.1	20.6	20.8	0.00615	0.00019	0.00596
0.418	20.6	21.1	20.6	20.9	0.00539	0.00023	0.00516
0.526	20.6	21.1	20.7	20.9	0.00559	0.00026	0.00533
0.662	20.6	21.0	20.7	20.9	0.00591	0.00023	0.00569
0.833	20.6	20.9	20.7	20.8	0.00593	0.00013	0.00580
1.049	20.6	20.9	20.7	20.8	0.00641	0.00010	0.00632
1.321	20.6	21.2	20.9	21.0	0.00750	0.00035	0.00715
1.663	20.8	21.2	20.8	21.0	0.00748	0.00039	0.00709
2.100	20.8	21.2	20.9	21.0	0.00814	0.00045	0.00769
2.650	20.8	21.3	20.8	21.0	0.00817	0.00042	0.00776
3.333	20.8	21.3	20.9	21.0	0.00900	0.00045	0.00855
4.183	20.8	21.2	21.0	21.0	0.00900	0.00045	0.00855
5.266	20.7	21.3	21.0	21.0	0.00962	0.00042	0.00920
6.633	20.7	21.3	20.9	21.0	0.00962	0.00039	0.00924
8.350	20.7	21.2	20.9	20.9	0.01043	0.00032	0.01011
10.500	20.7	21.3	21.0	21.0	0.01075	0.00042	0.01033
13.216	20.6	21.2	20.9	20.9	0.01133	0.00029	0.01104
16.633	20.5	21.2	21.0	20.9	0.01165	0.00023	0.01142
20.933	20.6	21.3	21.0	21.0	0.01210	0.00035	0.01174
26.590	20.8	21.1	21.0	21.0	0.01255	0.00035	0.01220
33.340	20.6	21.2	21.0	21.0	0.01256	0.00035	0.01221
41.840	20.2	20.9	20.7	20.6	0.01274	-0.00013	0.01287
52.590	20.4	20.9	20.7	20.6	0.01325	-0.00006	0.01331
66.340	19.8	20.7	20.6	20.3	0.01346	-0.00048	0.01394
83.340	20.0	20.6	20.6	20.4	0.01376	-0.00042	0.01417
105.090	19.8	20.5	20.5	20.2	0.01403	-0.00071	0.01474
132.090	19.7	20.3	20.4	20.0	0.01440	-0.00087	0.01527
166.340	19.5	20.3	20.3	19.9	0.01484	-0.00103	0.01588
209.340	20.1	20.6	20.6	20.4	0.01586	-0.00039	0.01624
263.590	20.6	21.0	21.0	20.8	0.01755	0.00019	0.01735
331.840	20.6	21.1	21.1	20.9	0.01773	0.00032	0.01741
417.840	20.6	21.2	21.3	21.0	0.01876	0.00045	0.01831

525.840	19.9	20.8	21.3	20.5	0.01948	-0.00019	0.01967
662.090	20.5	21.0	21.3	20.8	0.01958	0.00019	0.01938
833.340	19.8	20.6	21.0	20.4	0.02085	-0.00042	0.02127
1049.171	20.4	21.3	21.7	21.0	0.02202	0.00042	0.02160
1320.921	21.3	21.8	21.8	21.6	0.02192	0.00122	0.02069
1532.637	20.5	21.6	21.8	21.2	0.02273	0.00064	0.02209

3. Annex: Certificates

3.1. ISO 9001 certificate

CERTIFICATE TÜV NORD

Management system as per
DIN EN ISO 9001 : 2008

Richard Bergner Elektroarmaturen GmbH & Co. KG
Bahnhofstraße 8 - 16
91126 Schwabach
Germany

with the places
Schwabach and Radebeul

Fittings and engineering services for electrical power industry, catenary wire systems, telecommunication appliance and substation clamps

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date: 15.06.11

Заличено по чл. 36а, ал.3 от ЗОП

3.2.Load cell 100 kN

RIBE Richard Bergner Elektroarmaturen GmbH + Co. KG
EKL Schwabach den 09.03.2011

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zer102_18 **Seitenanzahl:** 2
Gültigkeitsdauer: 12 Monate

Die Kalibrierung wurde entsprechend der zugehörigen Arbeitsanweisung "Arb102_2" ausgeführt.

Gegenstand der Kalibrierung:
Seilzugkraftmeßkette des Prüfstandes Spur 3 im Innenraumschwingungsstand, bestehend aus;

Geräte:	Zugkraftaufnehm.;	Meßverstärker;
Type:	K 11;	PAX S;
Hersteller:	LORENZ;	LORENZ;
Seriennr.:	48070;	7524;
Sonstiges:		Kalibrierwert-anzeige

Referenzmeßkette:

Geräte:	Kraftaufnehmer;	Meßverstärker;
Type:	U2A (XM001);	MC55 (AB12);
Hersteller:	HBM;	HBM;
Seriennr:	F 18511;	ohne;
Genauigkeitskl.	0.1;	Referenzwert-anzeige

Einzelheiten der Referenzmeßkette sind im gültigen Kalibrierschein Nr.: **FL885 HBM 2009-09** der Firma HBM vom **2009-09-07** beschrieben, die Kalibrierung ist im Sinne der DIN EN ISO 9001 und DIN ISO 10012, Teil 1 auf nationale Normale rückführbar.

Meßwerte: siehe Rückseite **Prüfdatum:** 09.03.2011

Prüfer: Jung / Heinl **Unterschrift:**

Заличено по чл. 36а, ал.3 от ЗОП

MOODY INTERNATIONAL
Reviewed
Witnessed
Date 15.06.11
DE - 0029

Заличено по чл. 36а, ал.3 от ЗОП

3.3.Displacement sensors

Kalibrierschein nach DIN ISO 10012 Teil 1

Kalibrierscheinbezeichnung: Zert125_18 **Seitenanzahl:** 3
Gültigkeitsdauer: 12 Monate

Die Kalibrierung wurde entsprechend der Arbeitsanweisung " 125/1 " durchgeführt.

Gegenstand der Kalibrierung: Beide Wegtaster für getrennte Wegmessungen, Taster B mit 25[m] Verlängerungskabel.

Meßkette für Kriechdehnungsmessungen an Seilen und Kabeln bis 200[kN], bestehend aus:

Geräte:	Wegtaster A	Wegtaster B	Verstärker
Type:	WA 50 mm	WA 20 mm	SPIDER
Hersteller:	HBM	HBM	HBM
Seriennr.:	82810077	40710321	-
Genauigkeitskl.:	0,1	0,1	0,1
Sonstiges:	6-Leiter	6-Leiter	

Referenzmaße:

Geräte:	Endmaßsatz	Haltevorrichtung
Type:	-	-
Hersteller:	C.Johansson	RIBE
Seriennr:	11	-
Genauigkeitskl.:	1 bei 20°	-
Sonstiges:	DKD - 17301	-

Einzelheiten der Referenzendmaße sind im gültigen Kalibrierschein vom 21.6.2005 beschrieben. Die Kalibrierung ist im Sinne der DIN EN ISO9001 und DIN ISO 10012, Teil 1 auf nationale Normale rückführbar.

Meßwerte: siehe Rückseite **Prüfdatum:** 21.03.2011

Prüfer: Jung / Heinl **Unterschrift:**

Заличено по чл. 36а, ал.3 от ЗОП

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date: 11.04.11

Заличено по чл. 36а, ал.3 от ЗОП

Richard Bergner Elektroarmaturen GmbH & Co. KG is certified by TÜV NORD CERT GmbH in accordance with DIN EN ISO 9001:2008, certificate registration No. 04 100 950 150.

A quality management system in accordance with DIN EN ISO 9001 ensures a continuous inspection of measuring and test equipment. Reference standards traceable to national standards are available.

Richard Bergner Elektroarmaturen GmbH & Co. KG is a certified supplier of the Chinese „Ministry of Railways" (MoR).

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier by Sellihca Nordic Utility Pre-Qualification System with registration No.101109.

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of ADWEA, PCGIL and ESKOM.

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of E.ON AG, RWE AG and Vattenfall Europe AG for high voltage OHTL fittings, fittings for fibre optic cables and for damping systems.

Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of Deutsche Bahn AG, Nederlandse Spoorwegen and Österreichischen Bundesbahnen AG.

TÜV NORD
TÜV NORD CERT GmbH
DIN EN ISO 9001
Freiwillige Zertifizierung

MOODY INTERNATIONAL
☒ Reviewed
☐ Witnessed
Date: 15.06.11
DE - 0019

Salt Spray (Corrosion resistant) Test

Annex 12

Cable type:	ASLH-D(S)B 36 SMF (A20SA 37 – 2,9)
Cable product spec.:	TK 10471/10-03
Cable-ID:	10283527/6735
Test procedure:	EIA/TIA-455-16A

Test conditions:	duration:	min. 1000h
	temperature:	35°C
	salt concentration:	5%

Results: see report of independent laboratory

RIBE ELEKTROARMATUREN

Schwabach - Radebeul

Schwabach, 28 April 2011

PROTOCOL

Termination of test on OPGW

At the request of: **AFL Telecommunications GmbH**

Project: **Saudi Electricity Company SEC**
Saudi Arabia

The following test:

Test	OPGW
Salt Spray (Corrosion) Test	ASLH-D(S)b 36 SMF (A20SA 37 – 2,9)

was inspected in the presence of the persons named below. New samples were put into the salt spray chamber and the test will run another 1000 h.

The test procedure was found to be in order. The test results will be documented in final detailed reports.

Mr Saeed Hamad Al Kahtani / SEC
Mr Majid Abdulrahman Al Suhibani /
Mr Abdulaziz Abdulrahman Al Hagb
Mr Norbert Zimmermann / Moody
Mr Heribert Mühlen / AFL
Mr Carl-Magnus Kyrklund / AFL

Заличено по чл. 36а, ал.3 от ЗОП

Dr. Mario Dansachmüller / RIBE

Заличено по чл. 36а, ал.3 от ЗОП

Annexes

Annex 1 Salt Spray (Corrosion resistant) Test

Test standard:	EIA/TIA-455-16A, "FOTP-16 - Salt Spray (Corrosion resistant) Test for Fiber Optic Components"
Measurement devices:	Tensile test machine 40 kN (calibration certificate see Annex 3)
Test requirements:	No significant corrosive action, no significant degradation of tensile strength of wires.

Protocol

Annex 2 ISO 9001 Certificate

CERTIFICATE

TÜVNORD

Management system as per
DIN EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures, it is hereby certified that

Richard Bergner Elektroarmaturen GmbH & Co. KG
Bahnhofstraße 8 - 16
91126 Schwabach
Germany

with the places
Schwabach and Radebeul

[illegible]

Fittings and engineering services for electrical power industry, catenary wire systems, telecommunication appliance and substation clamps

Certificate Registration No. 04 [illegible]
Audit Report No. [illegible]

Valid until 2012-07-29
Last recertification [illegible]

Заличено по чл. 36а, ал.3 от ЗОП

Certification Body
at TÜV NORD CERT GmbH

Essen, 2009-07-30

[illegible]

TÜV NORD CERT GmbH [illegible] [illegible] www.tuev-nord-cert.de

IAF

RIBE ELEKTROARMATUREN
Schwabach - Radebeul

Test Report
K 8766e

Title: **Salt Spray (Corrosion) Test on Optical Ground Wire ASLH-D(S)b 36 SMF (A20SA 37 – 2,9) - dia. 8,6 mm manufactured by AFL Telecommunications**

File: 1.8

At the request of: AFL Telecommunications GmbH

Test standard: EIA/TIA-455-16A, "FOTP-16 - Salt Spray (Corrosion) Test for Fiber Optic Components"

Contents: 10 pages

Summary:
A Salt Spray (Corrosion) Test according to EIA/TIA-455-16A was carried out on samples of OPGW:

ASLH-D(S)b 36 SMF (A20SA 37 – 2,9) - dia. 8,6 mm

For details of OPGW see Appendix 1. The length of the specimens was 800 mm. Purpose of the test was to determine the effects of a controlled salt-laden atmosphere on the fiber optic cable.

Result:

Condition of the ACS wires: There were no signs of ferrous rust visible. After the test the mechanical strength of the wires was as specified.

The requirements were fulfilled.

Stefan Halbig
Development Engineer

Mario Dansachmüller
Test Engineer

Schwabach, 15th June, 2011

☐ Reviewed
☒ Witnessed
Date 29.04 + 15.06.11

Accreditation:

Das Qualitätsmanagementsystem der Richard Bergner Elektroarmaturen GmbH & Co. KG ist vom TÜV NORD CERT GmbH in Übereinstimmung mit DIN EN ISO 9001:2008 mit der Zertifikat-Registrier-Nummer 04 100 950 150 zertifiziert.

Adresses:

Manufacturer:	AFL Telecommunications GmbH Bonnenbroicher Str. 2-14 41238 Mönchengladbach, Germany
At the request of:	AFL Telecommunications GmbH Bonnenbroicher Str. 2-14 41238 Mönchengladbach, Germany
Test laboratory:	RIBE Test Laboratory Werk 2 Industriestr. 4 91126 Schwabach, Germany

MOODY INTERNATIONAL
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☒ Witnessed
28.04-15.06.11

Contents

This report consists of
Pages (in total) 10

MOODY INTERNATIONAL
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Date 28.04.15.06.41
DE - 0038

Заличено по чл. 36а, ал.3 от ЗОП

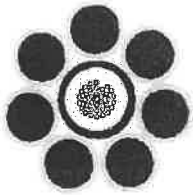
1. Drawing of test sample

AFL Telecommunications
A Fujikura Business

18.10.2010, WS.
120128200300-954216725 TK 10471/10-03

ASLH-D(S)b 36 SMF (A20SA 37 - 2,9)

Optical Ground Wire (OPGW) according to EN 60794-4 standards



- Stranding direction of outer layer: right hand (Z-stranding)
- Wires acc. to EN 61232
- Maximum fibre capacity per steel tube: 36
- Fibres coloured acc. to colour code system 036 F SEC
- Fibres acc. to G.652
- Impregnated wooden drum with protection

Configuration			
Center	1 Stainless Steel Tube with 36 SMF *Stainless steel tube material:* *DIN EN 10088-02, Mat. No. 1.4404*		2,90 / 3,40 mm
Layer 1	7 A20SA - Wires		2,60 mm

Mechanical Data		
Cable Diameter		8,6 mm
Cable Weight		275 kg/km
Supporting Cross Section		37,2 mm²
Rated Tensile Strength (RTS)		47,3 kN
Ratio RTS / Cable Weight		17,5 km
Modulus of Elasticity		162,0 kN/mm²
Thermal Elongation Coefficient		13,0 10^{-6}/K
Permissible Maximum Working Stress (42% RTS)		534,7 N/mm² (19,9kN)
Recommended Everyday Stress (16% RTS)		203,7 N/mm² (7,6kN)
Ultimate Exceptional Stress (72% RTS)		916,6 N/mm² (34,1kN)

Electrical Data		
DC Resistance (20°C)		2,325 Ω/km
Conductivity		20,0% IACS
Short Time Current	(1,0s, 50-200°C)	2,9 kA
Short Time Current	(0,3s, 50-200°C)	5,3 kA
Short Time Current Capacity I²t	(50-200°C)	8,3 kA²s

Application		
Maximum Permissible Installation Force		14,2 kN
Minimum Bending Radius	static	108 mm
	dynamic	129 mm
Normal Delivery Length		4000 m
Temperature Range	Installation	-10 to +50°C
	Transportation and Operation	-40 to +80°C

All Sizes and Values are Nominal Values

opgw_pro8.xls, Rev. 12.02
AFL Telecommunications GmbH

www.aftale.com

2. Test set-up and procedure

A salt spray chamber SSC 1000 manufactured by Weiss/Germany was used to create and maintain the salt spray (fog) test environment in accordance with EIA/TIA-455-16A.

A tensile test was carried out on the individual wires of a cable sample to establish their initial tensile strength.

Another sample of cable (approx. length 0.8 m) was placed in the salt spray chamber with a 15° inclination of its longitudinal axis to vertical. It was exposed to a salt spray (fog) environment for 1000 hours at 35°C ±1°C (test terminated on June 15th, 2011, 11:00). The salt-solution concentration was 5 %. It was prepared by dissolving 5 parts (by weight) of sodium chloride in 95 parts (by weight) of distilled water. The pH-value of the solution was maintained between 6.5 and 7.2, when measured at a temperature of 35±2°C.

3. Test results

On completion of the Salt Spray Test, the surface condition of the exposed wires of the cable sample was visually examined and photographed.

The surface of the ACS wires of the cable outer layer showed a dull appearance. The grease layer around the stainless steel tube containing the optical fibers was intact. After cleaning the stainless steel tube showed no signs of corrosion.

The individual ACS wires were then subjected to a tensile test to establish their tensile strength after the Salt Spray Test. A calibrated tensile test machine was used.

Tensile strength of wires, cable specimen not subjected to salt spray test

Wire	Wire material	Wire diameter mm	Tensile breaking load kN	Tensile breaking stress MPa	Min. tensile breaking stress after stranding acc. to IEC 61232 MPa
1st layer					
1	ACS	2.59	8.25	1565.90	1273
2	ACS	2.59	8.5	1613.35	1273
3	ACS	2.59	8.15	1546.92	1273
4	ACS	2.59	8.3	1575.39	1273
5	ACS	2.59	8.25	1565.90	1273
6	ACS	2.59	8.45	1603.86	1273
7	ACS	2.59	8.05	1527.94	1273
			Average:	**1571.32**	

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Date 28.04-15.05.07
DS - 0038

Заличено по чл. 36а, ал.3 от ЗОП

Tensile strength of wires after salt spray test

Wire	Wire material	Wire diameter mm	Tensile breaking load kN	Tensile breaking stress MPa	Min. tensile breaking stress after stranding acc. to IEC 61232 MPa
			1st layer		
1	ACS	2.59	8.35	1584.88	1273
2	ACS	2.59	8.2	1556.41	1273
3	ACS	2.59	8.3	1575.39	1273
4	ACS	2.59	8.4	1594.37	1273
5	ACS	2.59	8.25	1565.90	1273
6	ACS	2.59	8.5	1613.35	1273
7	ACS	2.59	8.4	1594.37	1273
			Average:	**1583.53**	

No significant change of tensile strength of wires.

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DE - 0039

Заличено по чл. 36а, ал.3 от ЗОП

Photographs:

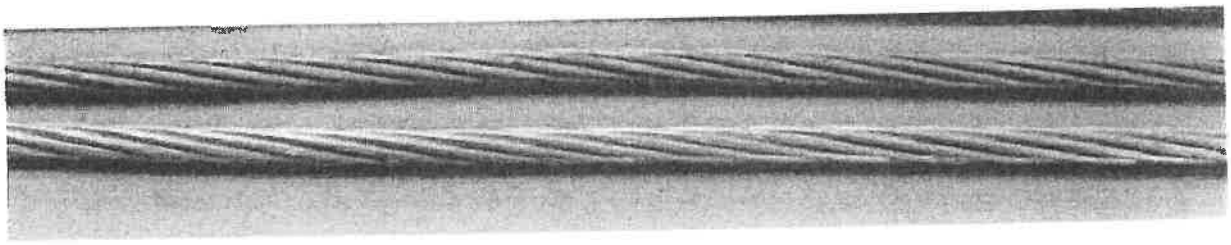

Fig. 1: Bottom cable specimen, no exposure to salt spray,
Top cable specimen after test and rinsing with clear water.

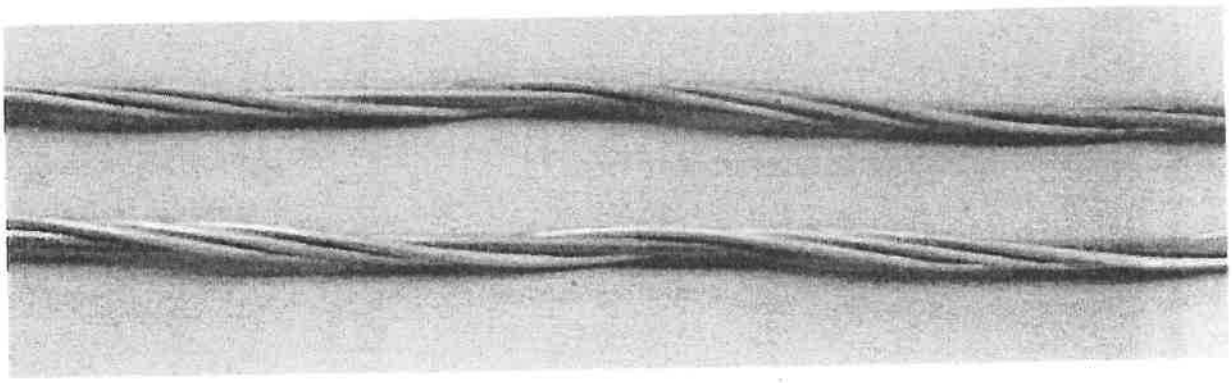

Fig. 2: Four wires of outer wire layer unwrapped. View of stainless steel tube. Bottom cable specimen, no exposure to salt spray. Top cable specimen after test.

4. Annex: Certificates

4.1.ISO 9001 certificiate

CERTIFICATE

TÜV NORD

Management system as per
DIN EN ISO 9001 : 2008

In accordance with TÜV NORD CERT procedures it is hereby certified that

Richard Bergner Elektroarmaturen GmbH & Co. KG
Bahnhofstraße 8 - 16
91126 Schwabach
Germany

with the places
Schwabach and Radebeul

applies a management system to the above standard for the following scope

Fittings and engineering services for electrical power industry, catenary wire systems, telecommunication appliance and substation clamps

Certificate Registration No. 04 100 [illegible]
Audit Report No. [illegible]

Valid until 2012-07-20
Initial certification 1996

Заличено по чл. 36а, ал.3 от ЗОП

Certification Body
at TÜV NORD CERT GmbH

Date

This certificate was issued in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

IAF

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Reviewed
Witnessed
Date: 15.06.11

Заличено по чл. 36а, ал.3 от ЗОП

4.2. Tensile test machine 40 kN

Zentrum für Konstruktionswerkstoffe
Staatliche Materialprüfungsanstalt Darmstadt
Fachgebiet und Institut für Werkstoffkunde
Prof. Dr.-Ing. C. Berger

TECHNISCHE UNIVERSITÄT DARMSTADT

Prüfzeugnis W 091797.2

über die Prüfung einer Werkstoffprüfmaschine nach DIN 51220

1. Ausfertigung

Auftraggeber:	RIBE, Richard Bergner Elektroarmaturen GmbH & Co. KG Bahnhofstraße 8 - 16 91126 Schwabach		
Bestell - Nr.:	91905 vom 30.11.09	Vertrag Nr.:	W 620
Aufstellungsort:	Werk II, Elektroarmaturen, Versuch und Entwicklung Abt. EE, Industriestraße		
Bauart/Typ:	40 kN Zugprüfmaschine / UHP4		
Hersteller:	Losenhausen Maschinenbau AG, Düsseldorf	Herstell - Nr.:	23218
Baujahr:	1970	Inv. –Nr.:	17-01-60
Beanspruchungseinrichtung:	Hydraulisch		
Messeinrichtung:	Pendelmanometer,		
Anzeigebereiche:	2/4/8/20/40 kN	Prüftemperatur:	21 °C
Masse der Pendelscheiben:	A = 15,175 kg; B = 12,090 kg; C = 3,025 kg		
Datum der Prüfung	17.12.2009	Prüfer:	Dipl.-Ing. V. Marzian

1 Prüfergebnis

Die Prüfung erfolgte nach DIN EN ISO 7500-1 und Beiblatt 1. Die Prüfmaschine entspricht dieser Norm bei zu- und abnehmender Prüfkraft und kann

im Anzeigebereich	von	bis	in der Klasse	Bemerkungen s. Abschnitt 3.2
40 kN Druck	4 kN	40 kN	1	
20 kN Druck	2 kN	20 kN	1	
	4 kN	20 kN	0,5	
8 kN Druck	0,8 kN	8 kN	1	
4 kN Druck	0,4 kN	4 kN	1	

für maßgebliche Versuche mit und ohne Benutzung des Schleppzeigers als Zusatzmesseinrichtung verwendet werden.

Staatliche Materialprüfungsanstalt Darmstadt
Kompetenzbereich Mess- und Kalibriertechnik
Grafenstraße 2, 64283 Darmstadt

Seiten: 6
Tabellen: 5
Bilder: ---
Anlagen: ---

Berichtsdatum: 21. Dezember 2009 Zeichen: W/Ma

Die Leitung **Der Sachbearbeiter**

i.A. i.A.

Prof. Dr.-Ing. R. Tscheuschner Dipl.-Ing. V. Marzian

Заличено по чл. 36а, ал.3 от ЗОП

MOODY INTERNATIONAL
Reviewed
Witnessed
Date: 15.06.11
DE - 0021

Заличено по чл. 36а, ал.3 от ЗОП

DKD

Akkreditiert nach DIN EN ISO/IEC 17025.
Die Akkreditierung umfasst die in der Akkreditierungsurkunde aufgeführten Prüfbereiche und Prüfverfahren

Die in diesem Bericht enthaltenen Ergebnisse und Ausführungen beziehen sich ausschließlich auf das angegebene Prüfgut. Die auszugsweise Wiedergabe dieses Berichts oder seine Verwendung für Werbezwecke bedarf der schriftlichen Genehmigung durch die Staatliche Materialprüfungsanstalt Darmstadt.

Richard Bergner Elektroarmaturen GmbH & Co. KG ist vom TÜV NORD CERT GmbH in Übereinstimmung mit DIN EN ISO 9001:2008 mit der Zertifikat-Registrier-Nummer 04 100 950 150 zertifiziert.

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Richard Bergner Elektroarmaturen GmbH & Co. KG is an authorized supplier of Deutsche Bahn AG, Nederlandse Spoorwegen and Österreichischen Bundesbahnen AG.

TÜV NORD
TÜV NORD CERT GmbH
DIN EN ISO 9001
Freiwillige Zertifizierung

MOODY INTERNATIONAL
☑ Reviewed
☐ Witnessed
Date: 15.06.11

Заличено по чл. 36а, ал.3 от ЗОП

Test report

No.: 12_186-2 **Version: 2/2**

Customer	:	AFL Telecommunications GmbH Bonnenbroicher Straße 2-14 41048 Mönchengladbach
Test object	:	Optical Ground Wire (OPGW)
Type	:	ASLH-D(S)b 48 SMF (27SA 75 - 10,0)
Manufacturer	:	AFL Telecommunications GmbH
Date of receipt	:	11.06.2012
Date of test	:	20.06.2012 - 22.06.2012
Applied test regulations	:	According to Terna-standard UX LC3907 in consideration of IEC 60794-4-1
Test carried out	:	- Short circuit test (I^2t = 50 kA^2s), Terna Test-No.: S - Lightning test (Q = 100 As), Terna Test-No.: BB
Test result	:	The OPGW, type ASLH-D(S)b 48 SMF (27SA 75 - 10,0) manufactured by AFL Telecommunications GmbH passed the short circuit test and lightning test according to Terna-standard UX LC3907.
Specialist testers	:	C. Pieper, H. Walter

Заличено по чл. 36а, ал.3 от ЗОП

Dortmund, 18.07.2012

H. Walter
Test engineer

A. Schlüter
Test engineer

Report No. 12_186-2 contains 12 pages and 5 annexes.

Summary

RWE Eurotest GmbH carried out a short circuit test and a lightning test according to Terna-standard UX LC3907 on an OPGW manufactured by AFL Telecommunications GmbH, type ASLH-D(S)b 48 SMF (27SA 75 - 10,0). The optical attenuation of the optical fibres was measured by the manufacturer during the tests. The recording of this measurement was carried out by RWE Eurotest.

The tests were witnessed by the following persons:

T. Mongelli (IMQ), U. Jansen (AFL Telecommunications GmbH)

Result of tests:
The OPGW, type ASLH-D(S)b 48 SMF (27SA 75 - 10,0) manufactured by AFL Telecommunications GmbH passed the short circuit test and lightning test according to Terna-standard UX LC3907.

Contents: **Page:**

Annex:

1. Applied test regulations

According to Terna standard

UX LC3907;Rev.00

Rules regarding the construction and testing of optical fiber shield wires

2. Technical data of the test object

ASLH-D(S)b 48 SMF (27SA 75 - 10,0)	
Cable Diameter	12.0 mm
Supporting Cross Section	75.4 mm²
Rated Tensile Strength (RTS)	74.5 kN
Nominal Short Circuit Rating	10 kA; 0.5 s (I^2t = 50.0 kA²s)

Table 1: Technical data of the test object (for details see annex 03)

3. Test and measuring equipment

Equip.-No.	cal.	Equipment	Type	Manufacturer
ET-505	*	Impulse current sensing resistor	ISM 250 P	Hilo Test
ET-506	*	Impulse current sensing resistor	ISM 250 P	Hilo Test
ET-507	*	Impulse current sensing resistor	ISM 250 P	Hilo Test
ET-533		50 kA high-current test equipment	GDPN 5000/12 Sp	Siemens
ET-651	*	ScopeCorder	DL750	YOKOGAWA
ET-770	*	Load cell	U2A 5t	HBM
ET-811	*	Fibre Optic Isolated Digitizing Subsystem	GEN7t	HBM
01-120	[1])	Optical Power Meter	ML 910 B	Anritsu
01-105	[1])	Optical Power Meter	MA 9301A	Anritsu
01-101	[1])	Stabilized Light Source	MG 9002 A	Anritsu
-		Edge-Emitting LED Source	MG 0918 D	Anritsu
-		Switch	-	AFL
-	*	Thermocouples 0.5 mm	NiCr-Ni	Rössel

*) Measuring equipment is calibrated based on national and international reference standards. Calibration certificates can be inspected on request.

[1]) Measuring equipment of AFL is calibrated based on national and international reference standards.

Table 1: Test and measuring equipment

The measurement uncertainty of the measuring instruments has been calculated and is archived by RWE Eurotest. Documents can be inspected on request.

4. Tests carried out and results

Short circuit test

A section of about 120 m of the OPGW under test was prepared by the customer and clamped into the test stand shown in figure 1. The OPGW was prepared with a protective spiral and a guy spiral. With a mechanical power drive in connection with a tension meter the wire tension was adjusted to 18 % of the Rated Tensile Strength (RTS) of the wire under test (13.4 kN at 20 °C). For purpose of mechanical damping during the short-circuit test two springs were installed at each end of the mechanical system including the test object (fig. 1).

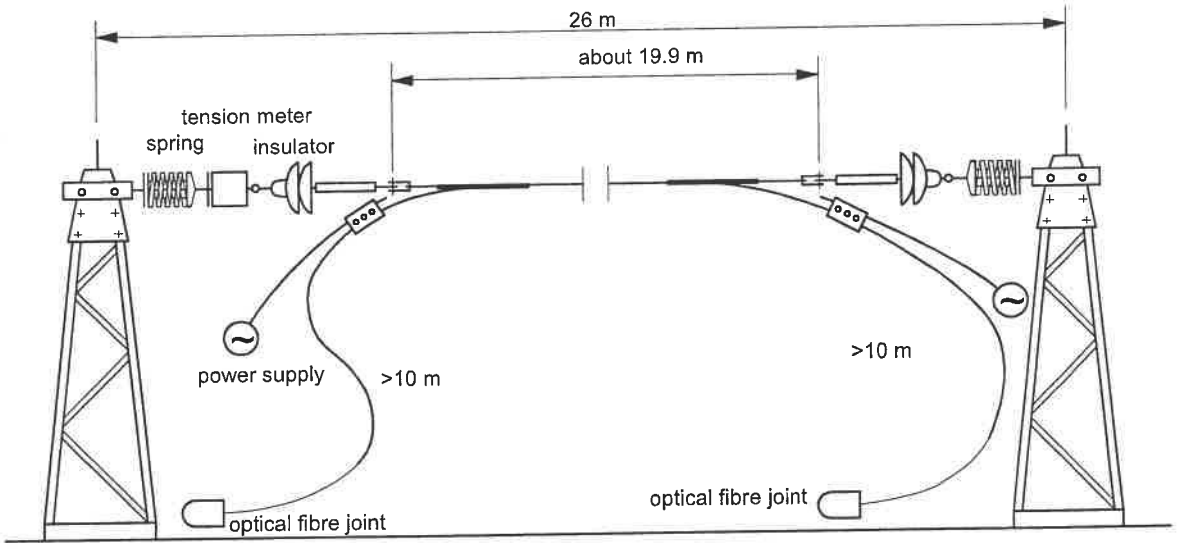

Figure 1: Test arrangement.

Thermometry

The temperature of the wire was measured with NiCr-Ni thermocouples (diameter of 0.5 mm) during the short-circuit test at trey points, T2 in the inner layer,10 mm on the left side and T3 in the inner layer, 10 mm on the right side of the middle of the test object. T4 was on the top in the middle of the test object (see fig. 2). T1 measured the ambient temperature.

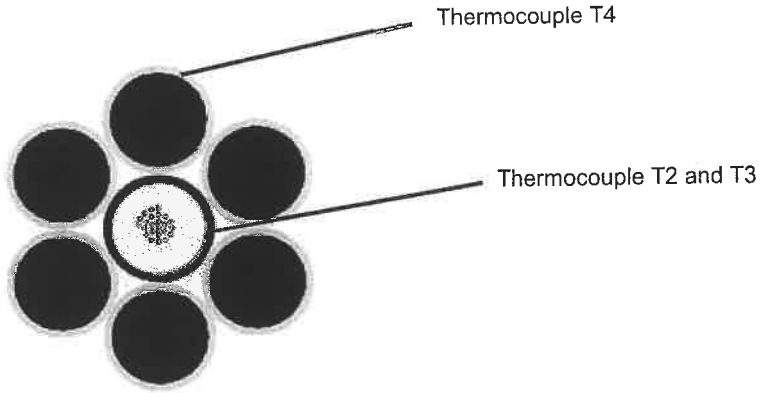

Figure 2: Points of temperature measurement.

Measurement of the optical attenuation

The measurement device for the optical attenuation was provided by the customer. Hereby the optical fibres of the test object were connected to about 5760 m fibre length.

Continuous recording of the optical attenuation of the fibres was done by RWE Eurotest.

Realization

The following short circuit tests were carried out:

- Test 1-5: Short circuit current (I^2t = 50 kA²s)

Rated tensile strength: 74.5 kN

Tensile load: 74.5 kN * 0.18 = 13.4 kN (20 °C)

Cable test length: approx. 120 m

Electrically stressed cable length: 20.60 m

Mechanically stressed cable length: 19.90 m

Number of short circuit tests: 5

Temperature before testing: 50 °C ≤ T ≤ 55 °C

Results of the test

The results of the tests are summarized in table 3 and table 4. The temperature-, attenuation-, short circuit current- and tensile load/time-diagrams are presented in annex 01.

Test	I_K [kA]	Duration [ms]	I^2t [kA^2s]
1	10.07	502.7	50.95
2	10.09	502.7	51.16
3	10.09	503.0	51.19
4	10.08	502.5	51.10
5	10.07	502.5	50.92

Table 3: Parameters of the short circuit tests.

	Test 1	Test 2	Test 3	Test 4	Test 5
υ_0 T2	50.6 °C	50.4 °C	50.3 °C	50.9 °C	50.1 °C
υ_{max} T2	249.2 °C	249.8 °C	250.5 °C	250.3 °C	249.6 °C
υ_0 T3	51.6 °C	50.9 °C	52.6 °C	51.9°C	52.0°C
υ_{max} T3	252.5 °C	250.5 °C	253.9 °C	253.6 °C	252.8 °C
υ_0 T4	52.5 °C	51.5 °C	52.1 °C	53.6 °C	53.2 °C
υ_{max} T4	240.0 °C	239.6 °C	241.8 °C	241.8 °C	240.8 °C
υ_0 - temperature before test υ_{max} maximum temperature					

Table 4: Results of the temperature measurement.

1. No damage was visible at the conductor after the tests.

2. The results of optical measurement showed no change of optical attenuation.

The OPGW, type ASLH-D(S)b 48 SMF (27SA 75 - 10,0) manufactured by AFL Telecommunications GmbH passed the short circuit test according to Terna-standard UX LC3907.

Lightning test

Test set up

A section of about 120 m of the OPGW under test was prepared by the customer and clamped into the test stand shown in figure 3. The OPGW was prepared with a protective spiral and a guy spiral. With a mechanical power drive in connection with a tension meter the wire tension was adjusted to 18 % of the Rated Tensile Strength (RTS) of the wire under test (13.4 kN). For purpose of mechanical damping during the lightning test two springs were installed at each end of the mechanical system including the test object (figure 3).

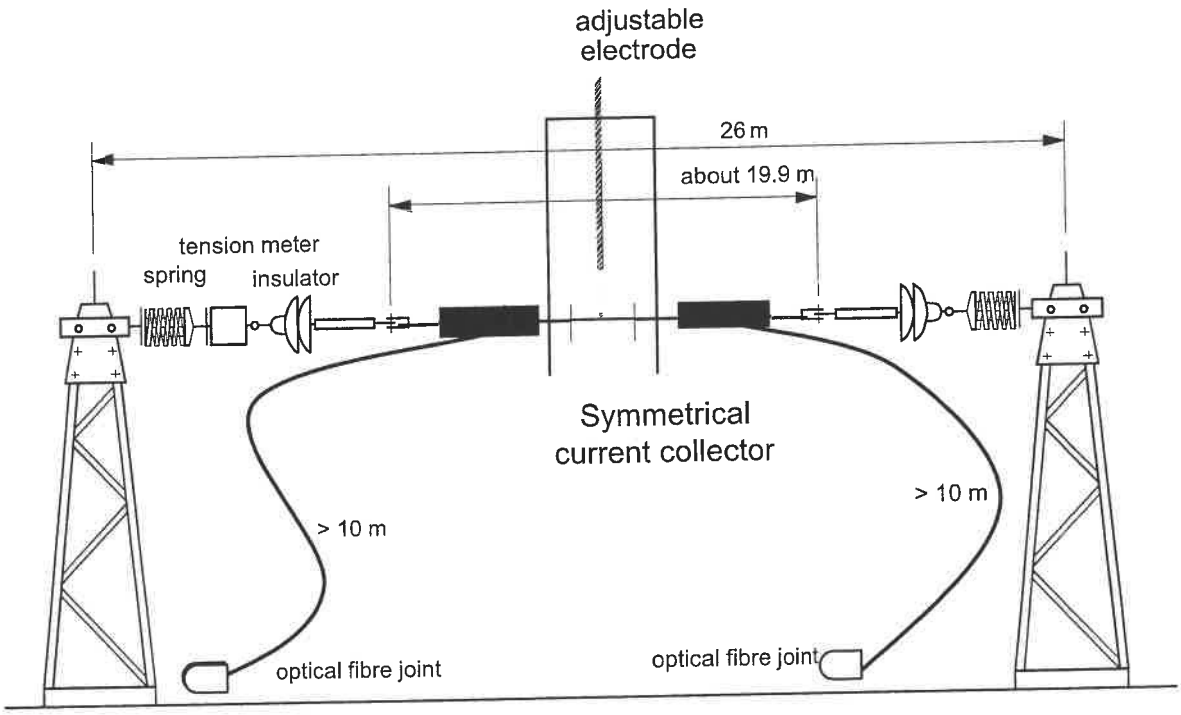

Figure 3: Test set-up lightning test

The upper rod electrode is vertically adjustable and placed above the OPGW according to Terna-standard UX LC3907. It is rounded at the end and has a diameter of 25 mm. With a wire (copper, ∅ 0.4 mm) the lightning current is ignited. The ground wire under test is symmetrically connected to the power source in order to minimize the magnetic force on the arc and to test under the hardest condition.