

Test Intention:

In test 4248 we want to proof the lifetime of chainflex® cables inside a pulley application for fork lifters.

Client:

Name: R. Habering

Team: chainflex®

Date: 18.10.2011

Result:

Order-Info:

Customer/ No.: igus® GmbH, Spicher Str.1a, 51147 Köln

Series / No: CF77.UL.15.04.D, CFBUS.045, CF9.15.04

Installation type: Vertical, wheel application

Customer test: Yes No

Development test: Yes No

Technical data

Target & Examination

E-Chain type: --/--

Cable length [m]: 15,0

E-Chain Radius [mm]: --/--

Target [double strokes]: **Lifetime**

Stroke [m]: 4,1

Optical check:

a acceleration [m/sec²]: 1

Abrasion jacket:

v velocity [m/s]: 1 (6500 DS/day)

Resistance shield:

Temperature [°C]: approx. 25°C

Resistance cores:

Experimental setup (Sketch, Photo ...)

Checklist for the experimental preparations

- additional inscription/label at all wires
- strain reliefs at both ends of the chain
- correct electrical connection of all wires
- radius was marked at the cables and the energy chain

1. Construction:

This test is built up on the „Vertikalachse“. The following pictures show the test structure:



The fixed points with Stauff strain reliefs size 1 (article 1806 size 10mm) and the spring pulling with a **force of 20N** (right)



The vertical tower (left) and the moved wheels (middle)

2. Cable and hose packages:

- No. 1: **1x CF77.UL.15.04.D** with the cable marking
00478m igus CHAINFLEX CF77.UL.15.04.D 4G1,5 300/500V E310776 C \mathcal{R} Uus AWM Style 20233 AWM I/II A/B 80°C 300V FT1 CE C N/DI DESINA RoHS conform www.igus.de
- No. 2: **1x CFBUS.045** with the cable marking
04067m igus CHAINFLEX CFBUS.045(4x2x0,15)C E310776 C \mathcal{R} Uus AWM Style 21371VW1 AWM I/II A/B 80°C 30V FT1 CE N N/CH DESINA Ethernet/CAT5 conform RoHS conform www.igus.de
- No. 3: **1x CF9.15.04** with the cable marking
08403m igus CHAINFLEX CF9.15.04 4G1,5 300/500V CE S N/BG RoHS conform www.igus.de
- No. 4: **1x CF9.07.12** with the cable marking
01427m igus CHAINFLEX CF9.07.12 12G0,75 300/500V CE M O/AH RoHS conform www.igus.de

3. Description of the cable construction:

Standard igus chainflex® catalogue cable

4. Remarks:

To detect broken conductor or shielding wires we will measure the ohmic resistance of these cable no.1 (the cores of the samples are connected in series to measure the ohmic resistances). The cable no.2 was ready made with MAT CAT9040020 and we will measure the data transfer parameters regularly with a Fluke DTX-ELT.

The following chart gives an overview regarding the test parameters:

Cable no.	Cable type	E-chain radius [mm]	Outer diameter [mm]	Bending factor [xd]	Bending factor catalogue
1.1	CF77.UL.15.04.D	-	7,4	-	6,8
2.1	CFBUS.045	-	7,8	-	10
3.1	CF9.15.04	-	6,9	-	5,0
4.1	CF9.07.12	-	10,4	-	5,0

Cable no.	Cable type	Counter reading		Effectively tested ds	Cable okay after ... ds
		... mounting	... demounting		
1.1	CF77.UL.15.04.D	5.634.548	5.638.914	4.366	<4.366
2.1	CFBUS.045	5.638.914			
3.1	CF9.15.04	5.638.914	5.654.380	14.828	<14.828
4.1	CF9.07.12	5.921.310	6.641.794	720.484	708.260

Test-order was checked by ... [Rainer Rössel or Martin Göllner and further employee]

Date:	20.10.2011	Name:		Name:	Ch. Mittelstedt
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Result

Start Report 02.11.2011:

At the 02.11.2011 we started the test 4248 with a counter reading 5.634.548, we will measure the cables regularly.

Interim Report 03.11.2011:

At the 03.11.2011 we demounted cable no.1.1 with a counter reading 5.638.914 after 4.366 double strokes, because we noticed a cork screw. Also we mounted the cables no. 2.1 and 3.1.

Interim Report 10.11.2011:

At the 09.11.2011 we demounted cable no.3.1 at counter reading of 5.654.380 after 14.828 double strokes, because we noticed a cork screw.



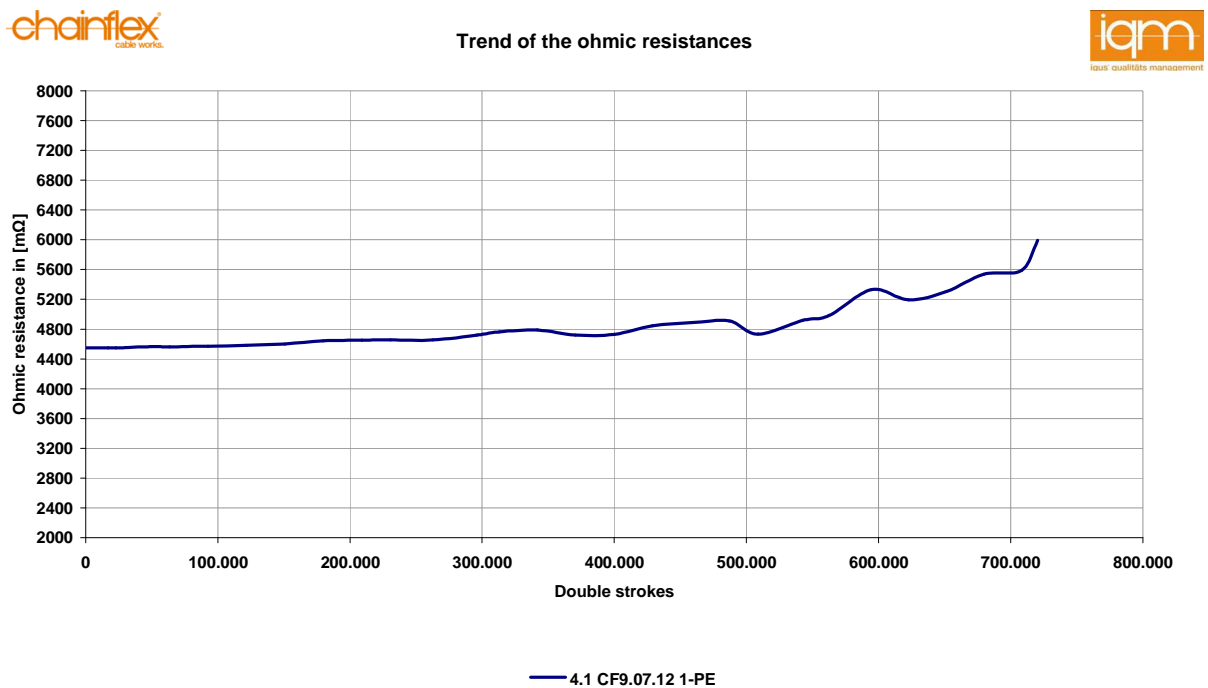
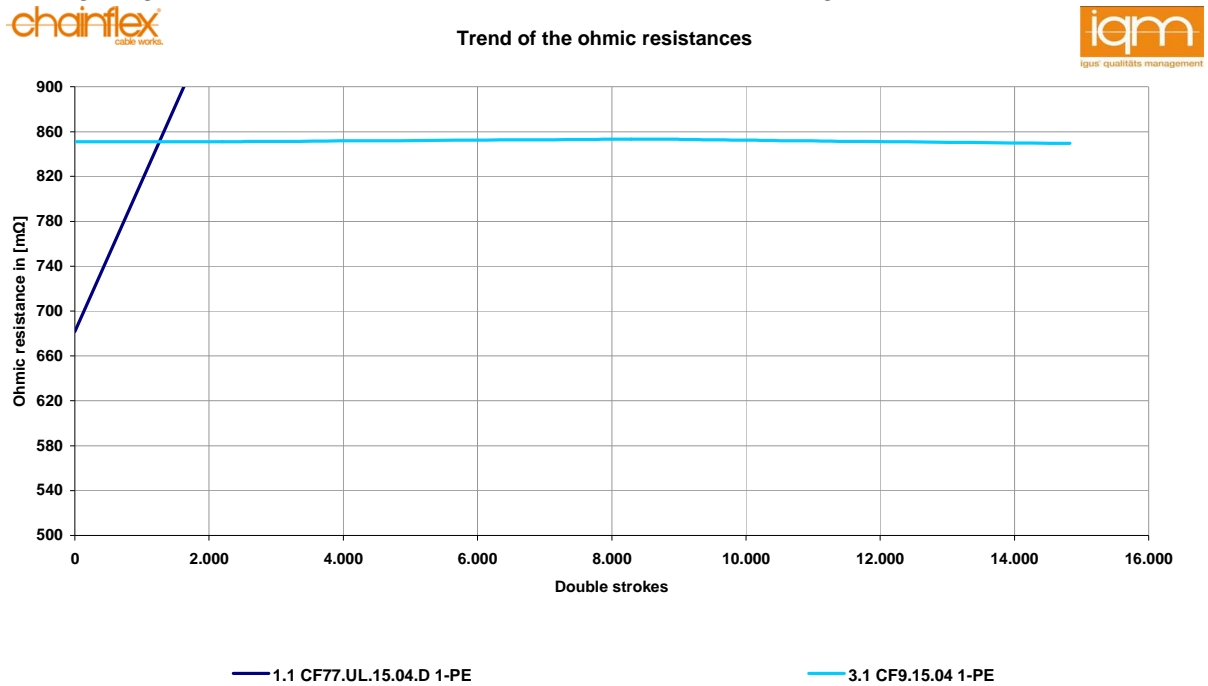
Interim Report 21.03.2012:

At the 21.03.2012 we mounted cable no.4.1 at counter reading of 5.921.310, we will measure the cables regularly.

Interim Report 21.09.2012:

At the 021.09.2012 we demounted cable no.4.1 after 720.484 double strokes, because the ohmic resistance was too high.

The following diagrams show the trend of the ohmic resistances during the test:



The measurement protocol of cable no. 2.1 is still in order after 2.700.473 cycles.



Kabelkennung: 4248-2.1

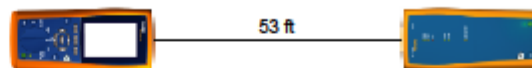
Datum/Uhrzeit: 10/11/2013 12:03:17 PM
Reserve 16.1 dB (NEXT 12-78)
Grenzwert: ISO11801 Channel Class D
Kabelltyp: Cat 5e FTP
Kalibrierungsdatum: 08/18/2008

Bediener: CF
Software-Version: 2.5200
Grenzwerte Version: 1.7000
NVP: 69.0%

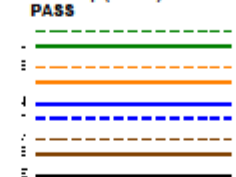
Testzusammenfassung: PASS

Modell: DTX-ELT
Hauptgerät S/N: 9751011
Remote S/N: 9751012
Adapter Hauptgerät: DTX-CHA002
Adapter Remote: DTX-CHA002

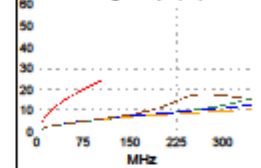
Länge (ft)	[Paar 12]	53
Laufzeit (ns), Gmz. 555	[Paar 45]	82
Abweichung (ns), Gmz. 50	[Paar 45]	4
Widerstand (Ohm), Gmz. 25.0	[Paar 78]	3.4
Einfüg.-Dämpf. Reserve (dB)	[Paar 45]	18.7
Frequenz (MHz)	[Paar 45]	100.0
Grenzwert (dB)	[Paar 45]	24.0



Wire Map (T568A)

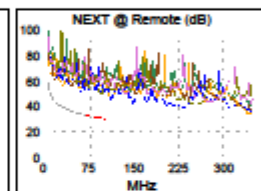
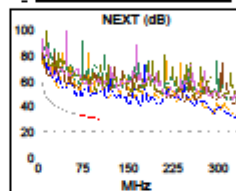


Einfüg.-Dämpf. (dB)

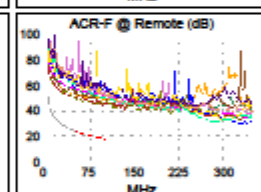
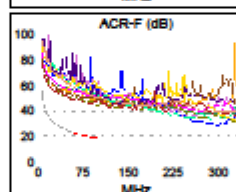


Min. Abstand Min. Wert

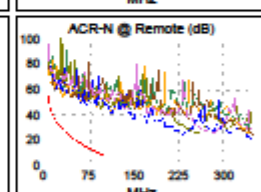
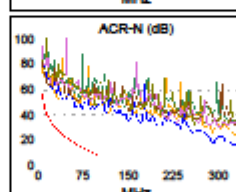
PASS	MAIN	SR	MAIN	SR
Schlechtest Paar	12-78	12-78	12-78	36-78
NEXT (dB)	16.1	18.4	16.1	19.0
Freq. (MHz)	67.5	67.0	67.5	92.3
Grenzwert (dB)	33.0	33.1	33.0	30.7
Schlechtest Paar	78	78	12	78
PS NEXT (dB)	18.6	19.9	19.2	19.9
Freq. (MHz)	67.5	91.8	84.0	91.8
Grenzwert (dB)	30.0	27.7	28.4	27.7



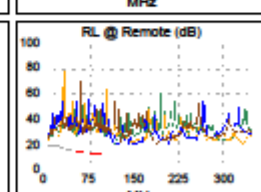
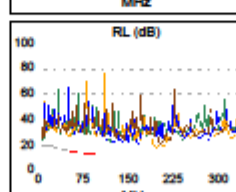
PASS	MAIN	SR	MAIN	SR
Schlechtest Paar	45-36	36-45	36-45	45-36
ACR-F (dB)	24.1	24.1	26.5	26.6
Freq. (MHz)	4.6	4.6	94.3	94.3
Grenzwert (dB)	44.1	44.1	17.9	17.9
Schlechtest Paar	36	36	45	36
PS ACR-F (dB)	26.7	27.0	28.2	28.2
Freq. (MHz)	5.6	5.9	94.3	94.5
Grenzwert (dB)	39.4	39.0	14.9	14.9



PASS	MAIN	SR	MAIN	SR
Schlechtest Paar	12-36	12-36	12-78	36-78
ACR-N (dB)	20.5	21.8	34.8	37.1
Freq. (MHz)	2.9	5.8	83.3	92.3
Grenzwert (dB)	51.9	45.5	9.7	7.7
Schlechtest Paar	36	36	12	78
PS ACR-N (dB)	21.9	23.3	36.7	37.9
Freq. (MHz)	2.9	5.1	84.0	91.8
Grenzwert (dB)	48.9	43.7	6.5	4.8



PASS	MAIN	SR	MAIN	SR
Schlechtest Paar	36	12	36	12
RL (dB)	11.9	13.1	11.9	15.0
Freq. (MHz)	46.0	50.0	46.0	99.8
Grenzwert (dB)	13.4	13.0	13.4	10.0



Erfüllte Network Standards:

100BASE-T	100BASE-TX	100BASE-T4
1000BASE-T	ATM-25	ATM-51
ATM-155	100VG-AnyLan	TR-4
TR-16 Active	TR-16 Passive	

LinkWare Version 8.0

Projekt: CF
Unbenannt1

Ort: IGUS



Evaluation

Dissection Report:

The following pictures show the dissected pieces of the cables

The condition of the cable no.1.1 (CF77.UL.15.04.D) after 4.366 cycles



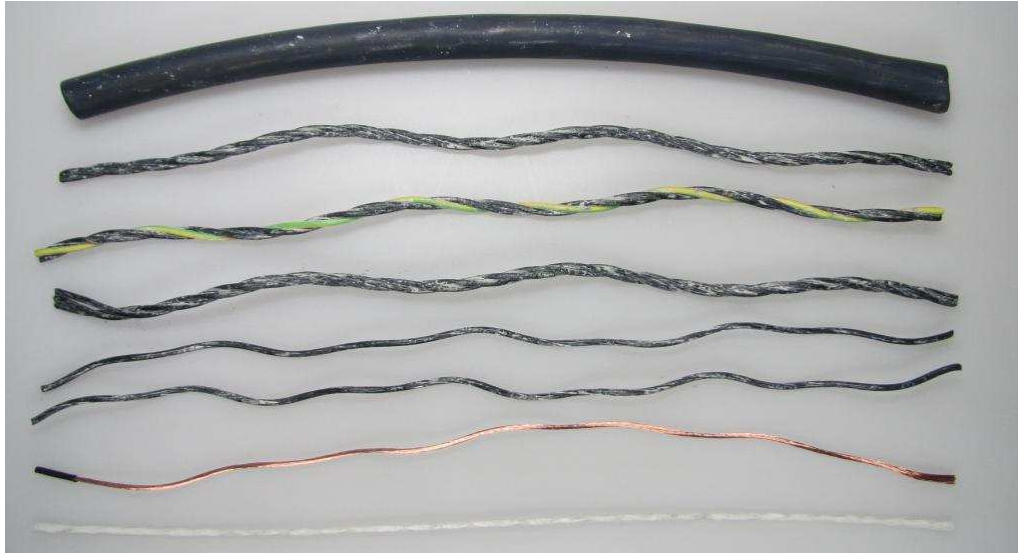
Double strokes [DS]	4.366
Condition outer jacket	Cork screw

The condition of the cable no.3.1 (CF9.15.04) after 14.828cycles



Double strokes [DS]	14.828
Condition outer jacket	Cork screw

The condition of the cable no.4.1 (CF9.07.12) after 720.484cycles



Double strokes [DS]	720.484
Condition outer jacket	Ok
Condition core insulation	Ok
Condition conductor	Single broken wires
Condition centre element	Ok

Name: **Ch. Mittelstedt**

Date: 21.03.2012