

Test Report

This test report describes the test results of the below mentioned paragliding harness.

All the tests were carried out by:

Air Turquoise – Para-test, official test laboratory of Switzerland.

para-test.com



Standards

Tests were carried out in conformity with the following standards:

- 2. DV LuftGerPV §1, Nr. 7 c (*note: in what follows this will be abbreviated by "LTF")
- European Standard EN1651 September 1999 (*note in what follows this will be abbreviated by "EN")
- European Standard EN12491 September 2001 (*note in what follows this will be abbreviated by "EN12491")

In addition to these standards we also considered the conclusions from the last 'Protector symposium' in Memmingen (D) Nov. 15, 2008, regarding the harness protector shock test.

Harness details

Manufacturer:	Kortel Design
Harness type:	Kruyer
Size:	Medium
Harness Weight:	0.5 kg
Maximum certified pilot weight:	100 kg
Impact protection type:	Airbag
Test responsible:	Eriksen R.
Test place:	Annecy
Test date:	June 16, 2009
Test room temperature & humidity:	20° C; 50 %rel
Certification number EN:	PH 0001.2009
Certification number LTF:	GZ 0001.2009



Test summary

A. STRUCTURAL STRENGTH TESTS

A test plan was set up in order to execute the different tests in an efficient order. The table below summarizes this test plan together with the applicable standards and results.

Test ID	TESTED ?	Standard Ref.		TEST Setup	Anchoring		Forces		Min. Test duration [sec]	Result
		EN	LTF		Attachment points	Dummy	Req. load in G	Min. force [N]		
1	✓	5.3.2.1		Default flying position	2 main attachment points	Hip fixated	6G	6000	10	OK
2	✓	5.3.2.2	4.2.1.a				9G	9000	5	OK
3	✓		4.2.1.b	Default, landing position	2 main att. points	Hip fixated, landing conf.	6G	6000	10	OK
4	✓	5.3.2.7					15G	15000	5	OK
5			4.2.1.a rescue	Rescue	2 rescue att. pnts.	Hip fixated	9G	9000	10	n/t
6		5.3.2.4					15G	15000	5	n/t
7			4.2.1.b rescue	Rescue, landing		Hip fixated, landing conf.	6G	6000	10	n/t
8	✓	5.3.2.3		One riser	ONE main att.	1 central hip fixation	6G	6000	10	OK
9			4.2.1.d	Towing	2 main att. + 2 tow att.	None	3G	3000	10	n/t
		5.3.2.5					5G	5000		
10	✓	5.3.2.6		Default, Negatif	One main att.	Head fix.	4.5G	4500	10	OK
11	✓		4.2.1.c	Upside down	2 main att. downw.	Head fix.	6G	6000	10	OK
12			4.2.1.c rescue	Upside down rescue	2 rescue att. downw.		6G	6000	10	n/t

B. HARNESS PROTECTION SHOCK TEST

Most paraglider harnesses are equipped with a protection device that damps the shock on the pilot's spine during a hard landing.





Shock impact tests have to be executed on these harnesses in order to prove the damping characteristics of it.

Test ID	TESTED ?	Standard Ref.	TEST Setup	Anchoring		Impact				Result	
		LTF		Attachment points	Dummy	Req. height [m]	Max. tolerated peak impact in g	Max Peak impact measured	Impact duration of +38 g (if any) recorded:		Impact duration of +20 g (if any) recorded:
PRO TECT 1	✓	5.1.1	Default flying position	Test dummy is attached to the harness like a pilot in flight.		1.5	+50g	12.5	n/t	n/t	n/t

C. Rescue deployment resistance test

The deployment of the rescue system has to be ensured in all circumstances of flight. This test is to verify whether the force needed to deploy is in between reasonable limits.

Test ID	TESTED ?	Standard Ref.	TEST Setup	Anchoring		Force for single hand deployment			Result
		LTF		Attachment points	Dummy	Min. force [N]	Max. force [N]	Resistance measured [daN]	
Resc depl	✓	6.1.5	Default flying position	Test responsible is attached to the harness like a pilot in flight. (no dummy required)		20 N	70 N	n/t	n/t

D. Rescue deployment strap strength test

The connection between handgrip and inner container has to have sufficient load capacity/structural strength in any situation that may arise during normal use. During this test is verified, whether this connection fulfill the requirements.

Test ID	TESTED ?	Standard Ref.		TEST Setup	Minimum force [N]	Min. Test duration [s]	Breaking resistance measured [daN]	Result
		LTF	EN 12491					
Resc strap	✓	6.1.8	5.3.2	Connection strap in tensile testing machine	700N	10	n/t	n/t





Detailed test reports

On the following pages detailed test reports for the different test are shown.

Harness Test		Test ID 1
Item:	Kruyer	
Client:	Kortel Design	
Test place & date:	Annecy ; June 16, 2009	
Test responsible:	Eriksen R.	
Temp. [°C] & Humidity:	20° C; 50 %rel	
Maximum certified pilot weight [kg]:	100 kg	
Standard	EN 1651 & 2. DV LuftGerPV §1, Nr. 7 c	
Test standard §:	5.3.2.1 (EN) & 4.2.1 a (LTF DV)	
Test setup:	Default flying position	
Anchoring:	Attachment points:	Both main riser attachments (3, 4)
	Dummy:	Default, hip fixed (7, 8)
Required load in G:	9G (EN: 6G)	
Min load [N]:	9000 N (EN: 6000)	
Min. duration [s]:	10 s	

Results	
Duration of maintained min. load [s]:	11.4 s
Average load during maintained test [daN]:	1411 daN

Comment: Passed

Graph:

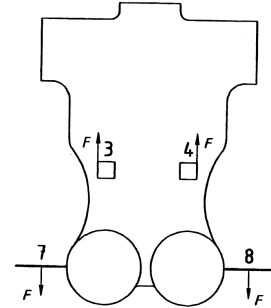


Harness Test

Test ID 2

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard EN 1651
Test standard §: 5.3.2.2
Test setup: Default flying position
Anchoring: Attachment points: Both main riser attachments (3, 4)
Dummy: Default, hip fixed (7, 8)
Required load in G: 15G
Min load [N]: 15 000 N
Min. duration [s]: 5s

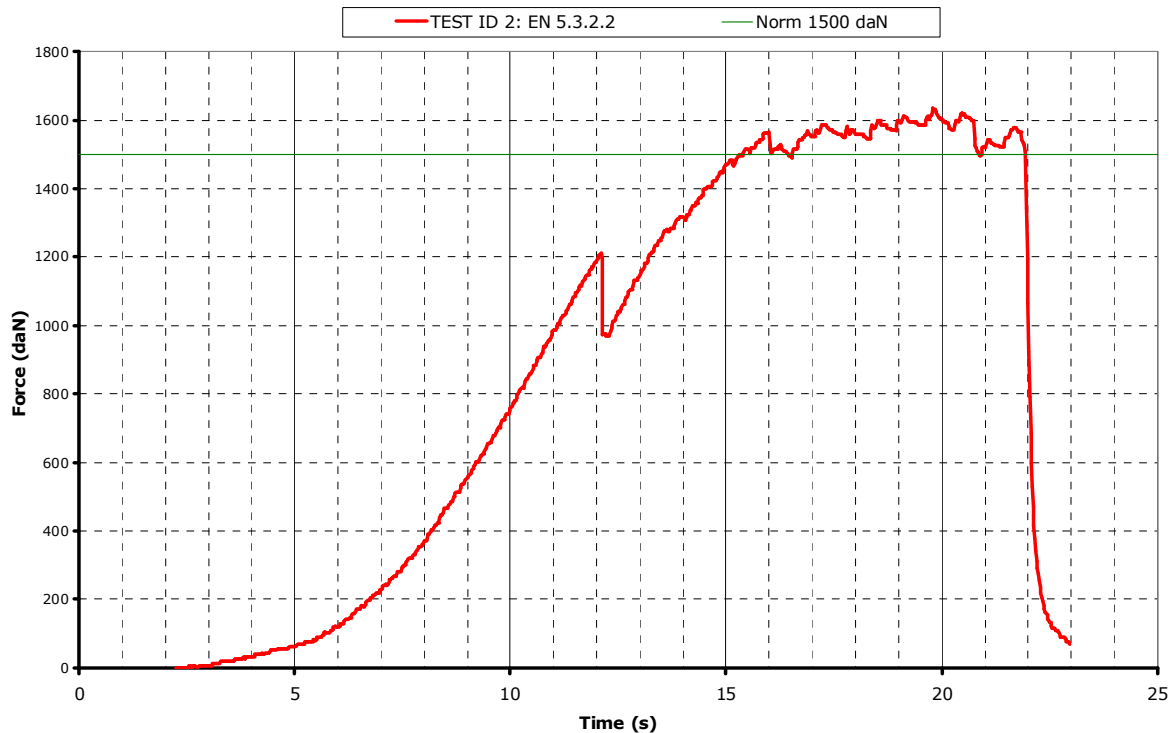


Results

Duration of maintained min. load [s]: 5.4 s
Average load during maintained test [daN]: 1570.0 daN

Comment: **Passed**

Graph:





Harness Test

Test ID 3

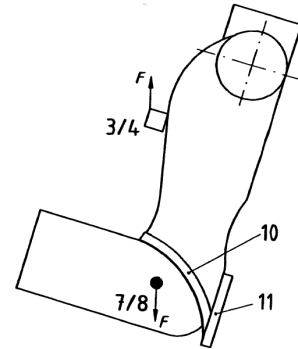
Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard 2. DV LuftGerPV §1, Nr. 7 c

Test standard §: 4.2.1.b

Test setup: Flying position before landing:
 seat board (11) in landing position, leg straps (10) closed.
Anchoring: **Attachment points:** Both of the main riser attachments attached (3 and 4);
Dummy: Default, hip fixed (7, 8)

Required load in G: 6G
Min load [N]: 6000 N
Min. duration [s]: 10 s



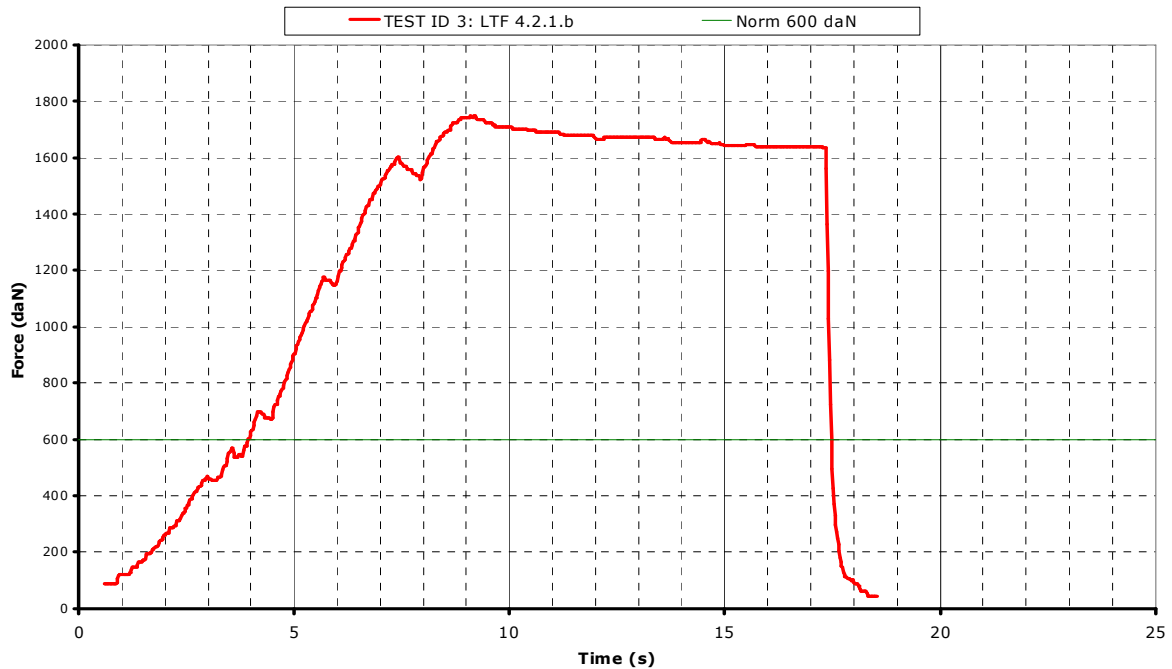
Results

Duration of maintained min. load [s]: 13.5 s

Average load during maintained test [daN]: 1516.3 daN

Comment: **Passed**

Graph:



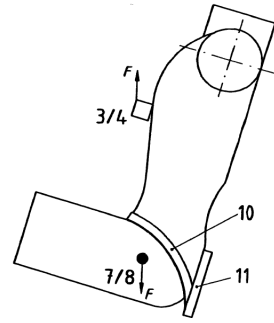


Harness Test

Test ID 4

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard EN 1651
Test standard §: EN 5.3.2.7
Test setup: Flying position before landing: seat board (11) in landing position, leg straps (10) closed.
Anchoring: **Attachment points:** Both of the main riser attachments attached (3 and 4);
Dummy: Default, hip fixed (7, 8)
Required load in G: 15 G
Min load [N]: 15 000 N
Min. duration [s]: 5

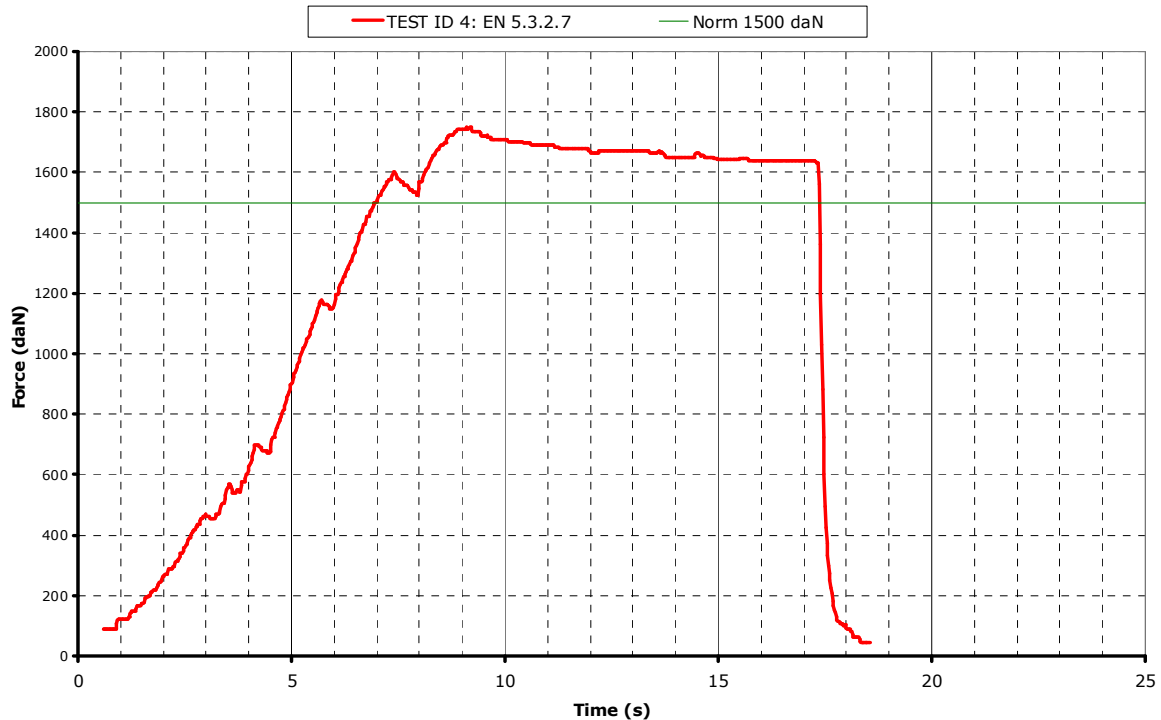


Results

Duration of maintained min. load [s]: 10.4 s
Average load during maintained test [daN]: 1659.3 daN

Comment: **Passed**

Graph:



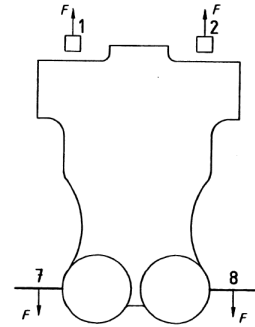


Harness Test

Test ID 5

Item:	Kruyer
Client:	Kortel Design
Test place & date:	Anancy ; June 16, 2009
Test responsible:	Eriksen R.
Temp. [°C] & Humidity:	20° C; 50 %rel
Maximum certified pilot weight [kg]:	100 kg

Standard	2. DV LuftGerPV §1, Nr. 7 c
Test standard §:	4.2.1.a rescue
Test setup:	Rescue attachments
Anchoring:	Attachment points: Rescue riser attachments (1,2)
	Dummy: Hip fixed (7, 8)
Required load in G:	9G
Min load [N]:	9 000 N
Min. duration [s]:	10 s



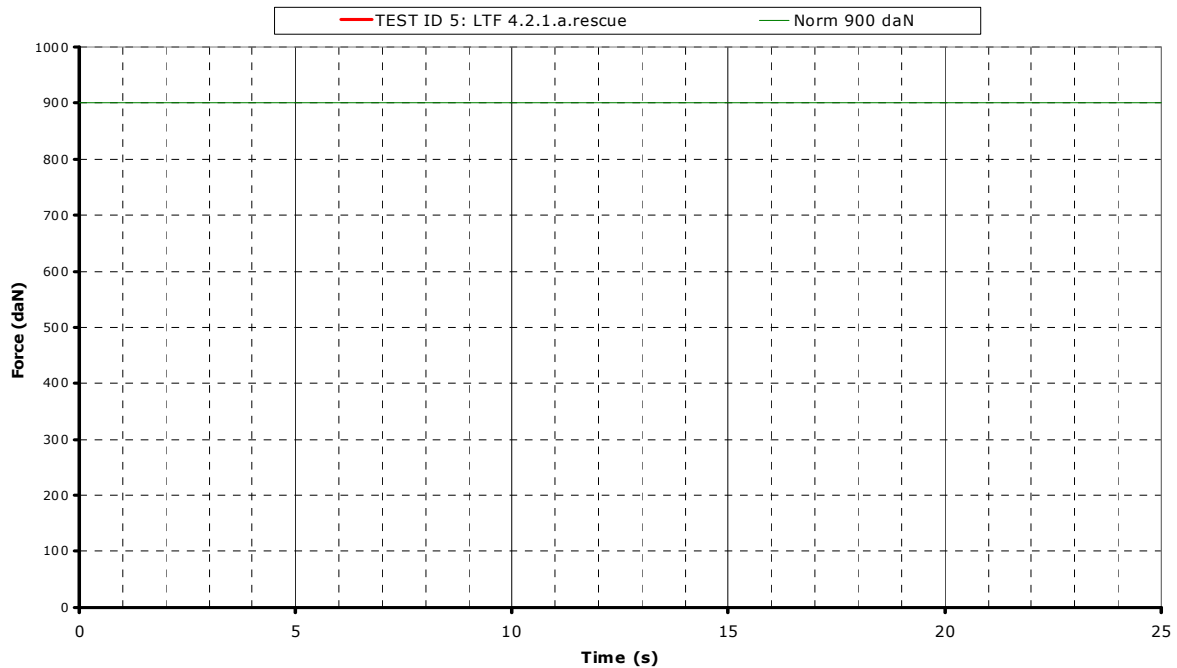
Results

Duration of maintained min. load [s]: n/a

Average load during maintained test [daN]: n/a

Comment: **Not applicable, no rescue system available**

Graph:



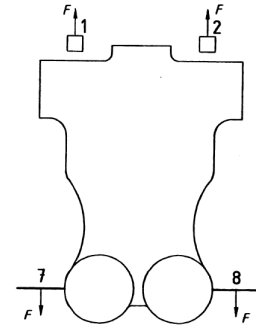


Harness Test

Test ID 6

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard	EN 1651
Test standard §:	5.3.2.4
Test setup:	Rescue attachments
Anchoring:	Attachment points: Rescue riser attachments (1,2)
	Dummy: Hip fixed (7, 8)
Required load in G:	15G
Min load [N]:	15 000 N
Min. duration [s]:	5 s



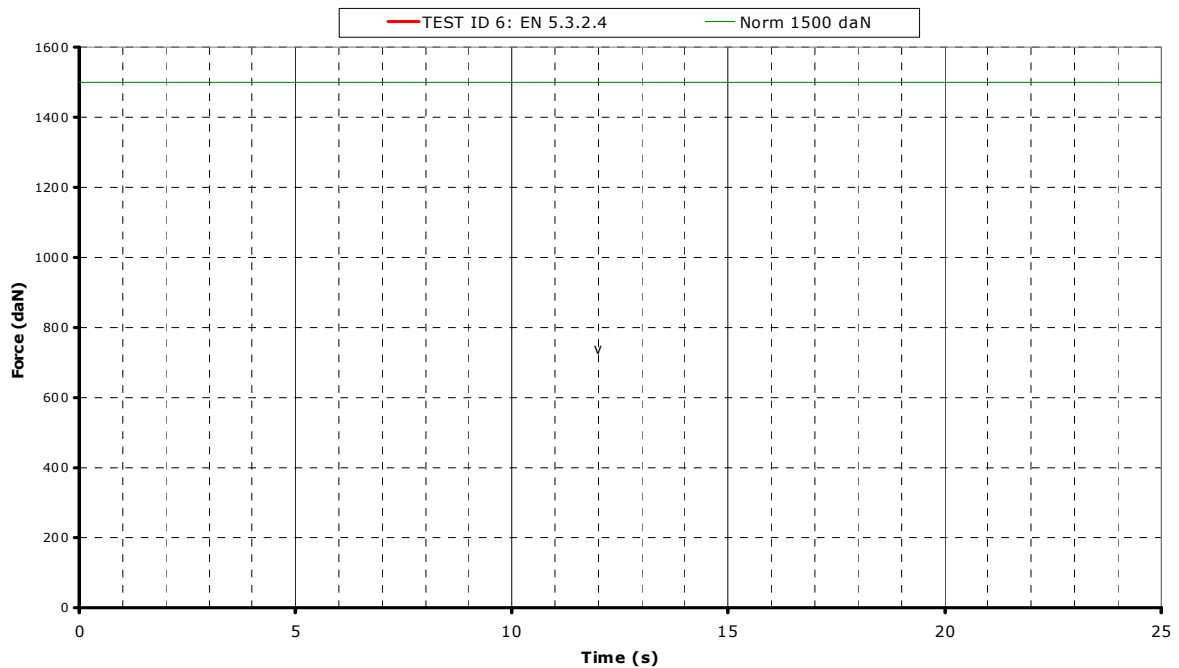
Results

Duration of maintained min. load [s]: n/a

Average load during maintained test [daN]: n/a

Comment: **Not applicable, no rescue system available**

Graph:





Harness Test

Test ID 7

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard 2. DV LuftGerPV §1, Nr. 7 c

Test standard §: 4.2.1.b rescue

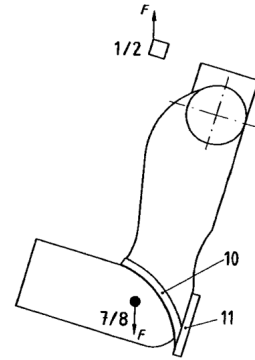
Test setup: Flying position before landing: seat board (11) in landing position, leg straps (10) closed.

Anchoring: **Attachment points:** Both of the rescue riser attachments attached (1 and 2);
Dummy: Default, hip fixed (7, 8)

Required load in G: 6 G

Min load [N]: 6 000 N

Min. duration [s]: 10 s



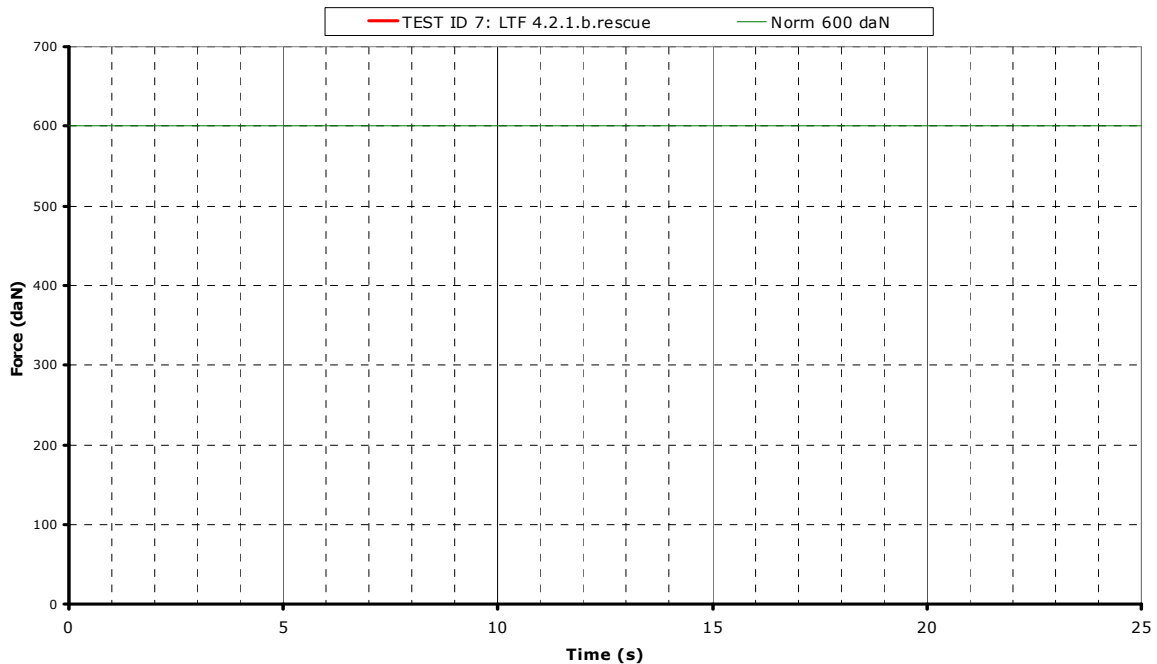
Results

Duration of maintained min. load [s]: n/a

Average load during maintained test [daN]: n/a

Comment: **Not applicable, no rescue system available**

Graph:



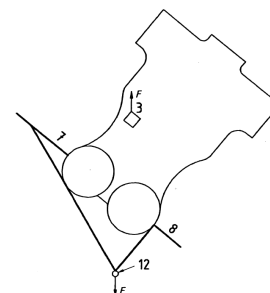


Harness Test

Test ID 8

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard EN 1651
Test standard §: 5.3.2.3
Test setup: Only one riser attached
Anchoring: **Attachment points:** One main riser attachments (3)
Dummy: Hip fixed (7, 8 -> 12)
Required load in G: 6G
Min load [N]: 6 000 N
Min. duration [s]: 10 s

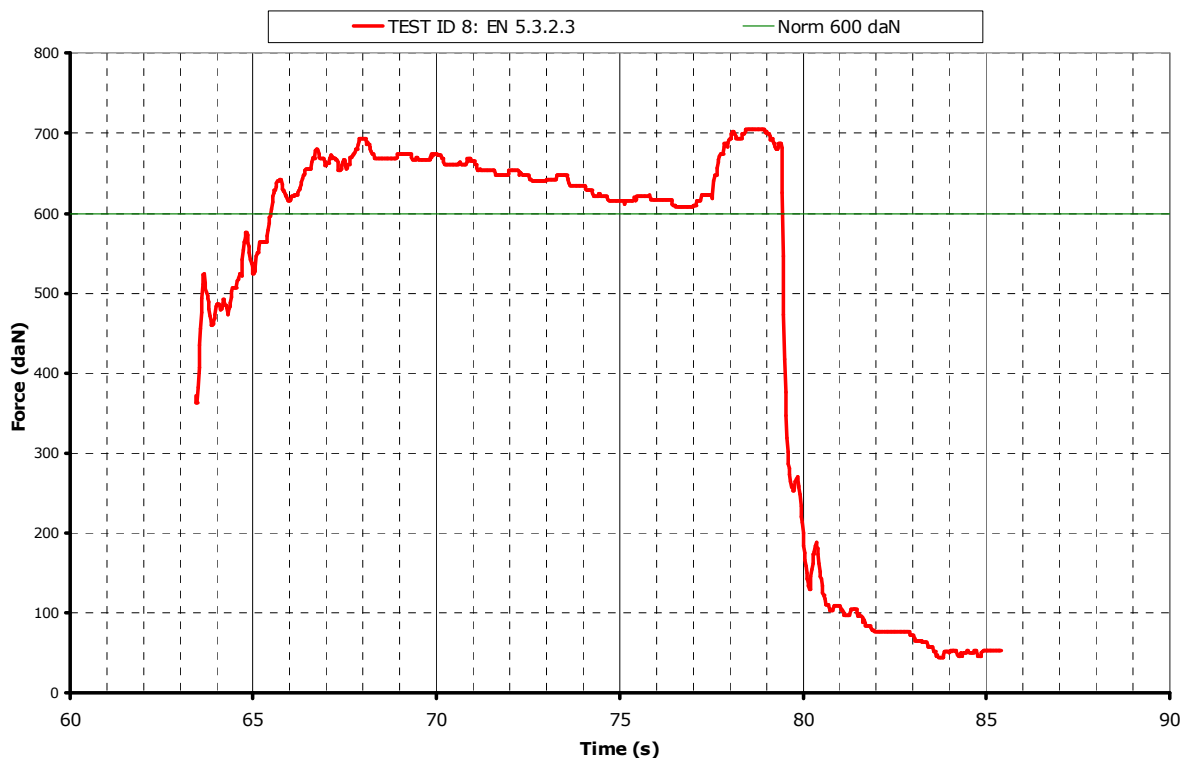


Results

Duration of maintained min. load [s]: 13.9 s
Average load during maintained test [daN]: 644.9 daN

Comment: **Passed**

Graph:





Harness Test

Test ID 9

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard EN 1651 & 2. DV LuftGerPV §1, Nr. 7c

Test standard §: 5.3.2.5 (EN) & 4.2.1.d (LTF)

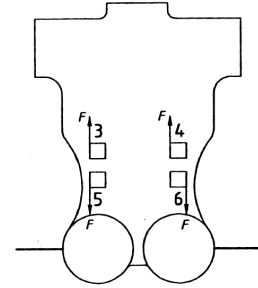
Test setup: Tow release attachments

Anchoring: **Attachment points:** Both main riser attachments (3, 4); Both tow release points (5, 6) → apply F in direction of towing cable.
Dummy: Dummy not anchored/attached

Required load in G: 5G (LTF: 3G)

Min load [N]: 5 000 N (LTF: 3000 N)

Min. duration [s]: 10 s



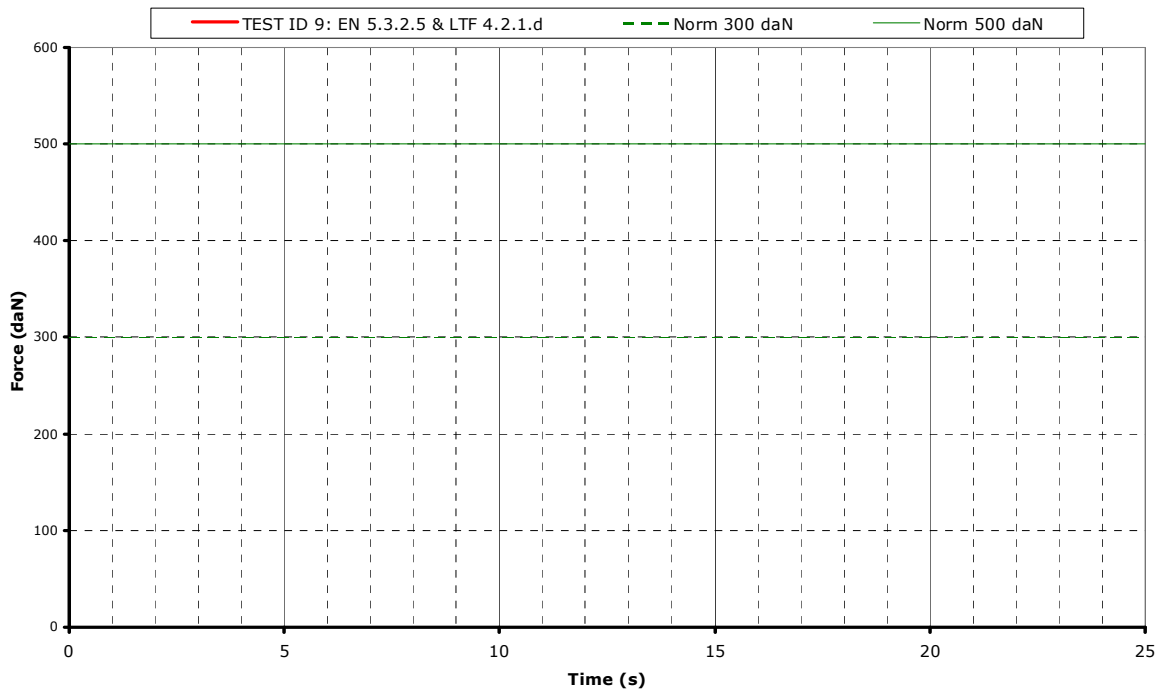
Results

Duration of maintained min. load [s]: n/a

Average load during maintained test [daN]: n/a

Comment: **Not applicable, no rescue system available**

Graph:



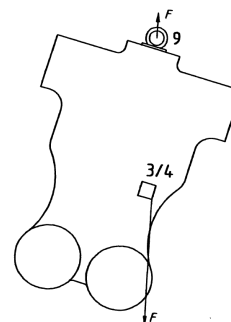


Harness Test

Test ID 10

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard EN 1651
Test standard §: 5.3.2.6
Test setup: Normal flying position in NEGATIF
Anchoring: **Attachment points:** ONE of the main riser attachments attached downwards(3 or 4);
Dummy: Dummy anchored at the head position (9)
Required load in G: 4.5G
Min load [N]: 4500 N
Min. duration [s]: 10 s



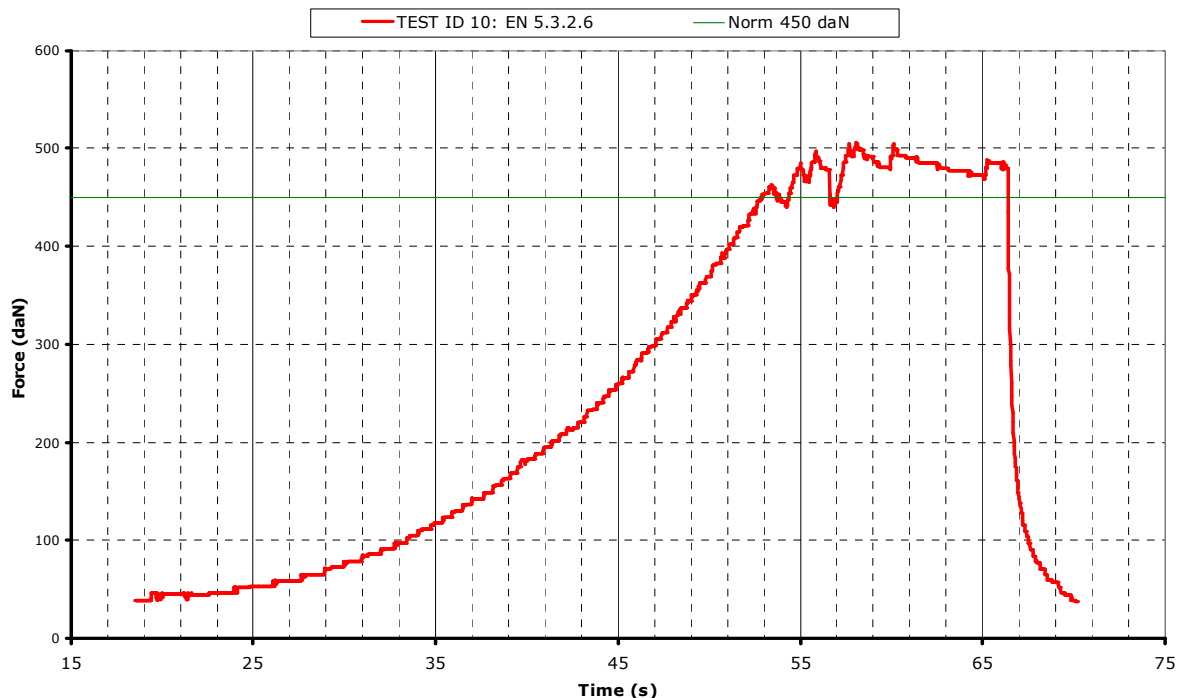
Results

Duration of maintained min. load [s]: 12.0 s

Average load during maintained test [daN]: 475.3 daN

Comment: **Passed**

Graph:



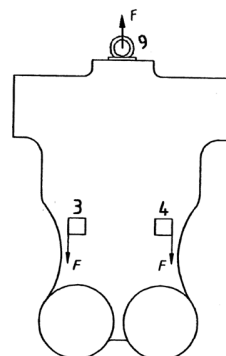


Harness Test

Test ID 11

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard 2. DV LuftGerPV §1, Nr. 7 c
Test standard §: 4.2.1.c
Test setup: Pilot upside down flying position
Anchoring: **Attachment points:** Both of the main riser attachments attached downwards (3 and 4);
Dummy: Dummy anchored at the head position (9)
Required load in G: 6 G
Min load [N]: 6 000 N
Min. duration [s]: 10 s

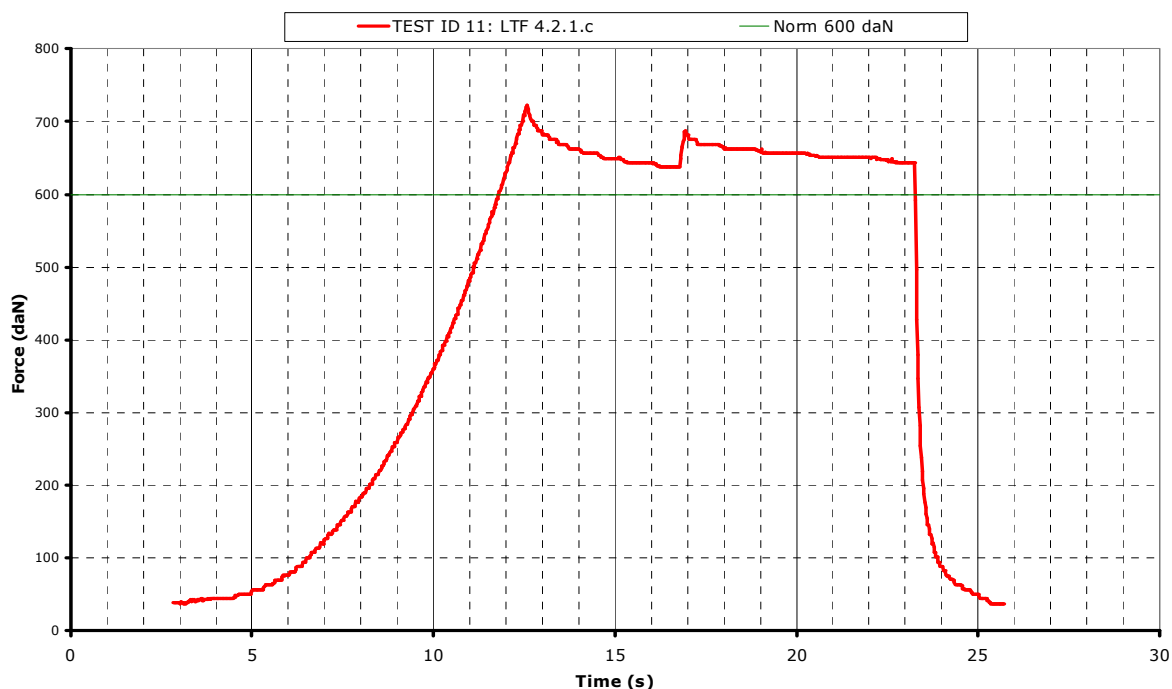


Results

Duration of maintained min. load [s]: 11.4
Average load during maintained test [daN]: 643.7 daN

Comment: **Passed**

Graph:





Harness Test

Test ID 12

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Erikssen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard 2. DV LuftGerPV §1, Nr. 7 c

Test standard §: 4.2.1.c rescue

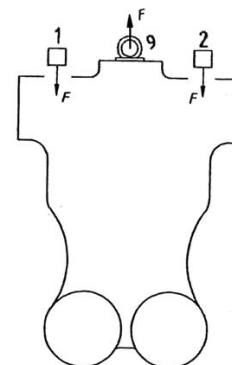
Test setup: Pilot upside down flying position

Anchoring: **Attachment points:** Both of the rescue riser attachments attached downwards (1 and 2);
Dummy: Dummy anchored at the head position (9)

Required load in G: 6 G

Min load [N]: 6 000 N

Min. duration [s]: 10 s



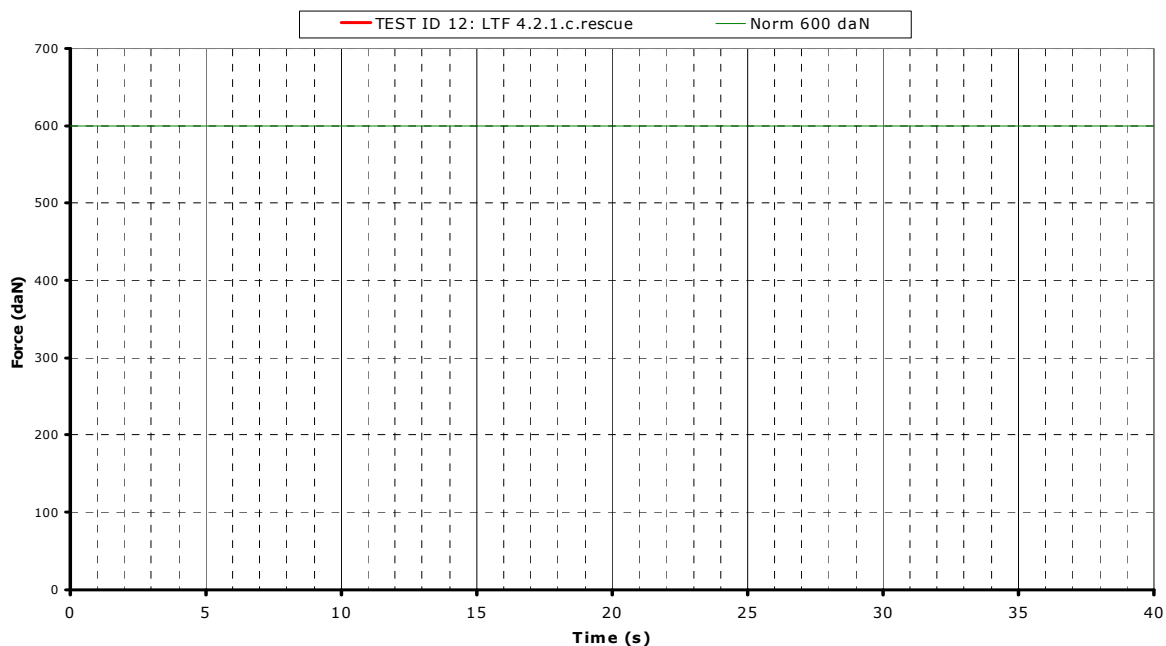
Results

Duration of maintained min. load [s]: n/a

Average load during maintained test [daN]: n/a

Comment: **Not applicable, no rescue system available**

Graph:





Protector shock test		Test ID Protect 1
Item:	Kruyer	
Client:	Kortel Design	
Test place & date:	Annecy ; June 16, 2009	
Test responsible:	Eriksen R.	
Temp. [°C] & Humidity:	20° C; 50 %rel	
Maximum certified pilot weight [kg]:	100 kg	
Standard	2. DV LuftGerPV §1, Nr. 7 c incl. conclusions 2e Protector-Symposium, Nov. 2008	
Test standard §:	5.1.1	
Test setup:	<p>Harness attached to protector test dummy, in a similar way like a real pilot in flight</p> <p>Impact will be simulated by dropping the dummy from a certain height.</p> <p>To simulate the "in-flight" conditions, the airbag is inflated with pressurized air equalling an airspeed of 7m/s. Inflation has to be stopped at least 5 sec before impact.</p> <p>Impact will be measured by an accelerometer mounted on the dummy. (Impact measured in g's)</p>	
Requirements:	Minimun height:	1.5 m (shortest distance between harness and impact surface)
	Impact requirements:	+50g as absolute maximum; +38g during less than 7 msec; +20g during less than 20 msec.
Results		
Impact at a height of 1.5m:	+12.5g	
Impact duration of+ 38 g (if any):	none	
Impact duration of +20 g (if any):	none	
Comment.	Passed	
Graph:		



Rescue deployment resistance test **Test ID resc depl**

Item: Kruyer
Client: Kortel Design
Test place & date: Annecy ; June 16, 2009
Test responsible: Eriksen R.
Temp. [°C] & Humidity: 20° C; 50 %rel
Maximum certified pilot weight [kg]: 100 kg

Standard 2. DV LuftGerPV §1, Nr. 7 c

Test standard §: 6.1.5

Test setup: The deployment of the rescue system has to be ensured in all circumstances, especially with a damaged glider.
 The pilot has to be able to deploy the rescue chute with a single pull out of the outer container, single handed and in an anatomical favorable direction.
 In order to simulate this, the test responsible deploys the rescue seated in the harness. In a similar way as in real flight. The deployment resistance is approximately measured by the load cell, which is placed between the hand of the test responsible and the rescue hand grip.
 On the other hand inadvertent deployment has to be fairly remote. Therefore a shear link has to withstand a minimum load

Requirements: **Max force for single hand deployment:** approx. 70 N
Max force for single hand deployment: approx. 20 N

Results

Measured peak to peak required force for deployment [daN]:

Comment: **Not applicable, no rescue system available**

Graph:

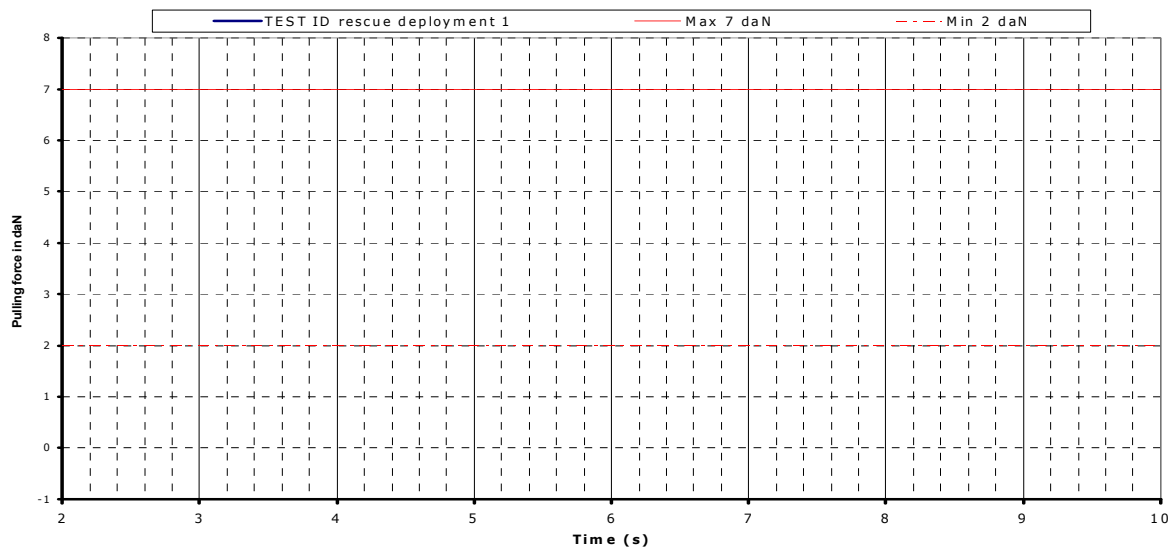




Tableau 1

Rescue deployment strap strength test		Test ID resc strap
Item:	Kruyer	
Client:	Kortel Design	
Test place & date:	Annecy ; June 16, 2009	
Test responsible:	Eriksen R.	
Temp. [°C] & Humidity:	20° C; 50 %rel	
Maximum certified pilot weight [kg]:	100 kg	
Standard	EN 12491 & 2. DV LuftGerPV §1, Nr. 7 c	
Test standard §:	5.3.2 (EN 12491) & 6.1.8 (LTF)	
Test setup:	<p>The handgrip of the outer container has to be connected to the inner container with a removable loop in a way that it is possible to use the inner container with different types of outer containers.</p> <p>The connection between handgrip and inner container has to have sufficient load capacity/structural strength in any situation that may arise during normal operation.</p> <p>In order to verify this, the connection is tested on its tensile strength by a default tensile testing setup.</p> <p>In addition to this the breaking resistance will also be measured.</p>	
Requirements: Min tensile strength for 10 s	700N (= 70 daN)	
Results		
Duration of maintained load [s]:	5,3 s	
Breaking resistance [daN]:	199 daN	
Comment:	Not applicable, no rescue system available	
Graph:		

After careful examination as explained in above mentioned test reports (from page 2 to page 18), the undersigned persons declare that the harness:

**Kortel Design
Kruyer
Medium**

Complies with:

- **European Standard EN 1651 September 1999**

And / or (if tested)

- **European Standard EN 12491 March 2001**

And / or (if tested)

- **2. DV LuftGerPV §1, Nr. 7 c**

Place, Date

Test responsible