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English Version

Paragliding equipment - Paragliders - Part 1: Requirements and test methods for structural strength

Équipement pour le parapente - Parapentes - Partie 1: Exigences et méthodes d'essai concernant la résistance de la structure

Ausrüstung für das Gleitschirmfliegen - Gleitschirme - Teil 1: Anforderungen und Prüfverfahren an die Baufestigkeit

This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 136.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (FprEN 926-1:2015) has been prepared by Technical Committee CEN/TC 136 “Sports, playground and recreationnal equipment”, the secretariat of which is held by DIN.

This document is currently submitted to the Formal Vote.

This document will supersede EN 926-1:2006.

In comparison with the previous edition, the following significant changes have been made:

a) editorial revision;

b) revision of line strength calculation method;

c) revision of the definition of the same model and test specimen selection;

d) deletion of Shock Loading Test Procedure B;

e) clarification of measurement interval in the sustained loading test;

f) addition of Manufacturing Record and Marking requirements.

This European Standard is one of a series of standards on equipment for paragliding as follows:

— EN 926-1, *Paragliding equipment — Paragliders — Part 1: Requirements and test methods for structural strength*

— EN 926-2, *Paragliding equipment — Paragliders — Part 2: Requirements and test methods for classifying flight safety characteristics*

Other relevant standards on equipment for paragliding are:

— EN 1651, *Paragliding equipment — Harnesses — Safety requirements and strength tests*

— EN 12491, *Paragliding equipment — Emergency parachutes — Safety requirements and test methods*

Introduction

The EN 926 series consists of two parts: EN 926-1 details paraglider structural strength requirements and EN 926-2 details paraglider flight tests requirements. Paragliders that have been tested and found to be compliant with both EN 926-1 and EN 926-2 are therefore compliant with the EN 926 series.

The aim of these standards is to enhance safety thus eliminating paragliders which display unacceptable behaviour in given situations on the basis of recognized tests set in these two standards.

1 Scope

This European Standard is applicable to paragliders as defined in 2.1.

This part of EN 926 specifies requirements and test methods for the resistance of a paraglider to static and dynamic loads and sets the minimum strength threshold for its qualification.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
paraglider
ultra-light glider with no primary rigid structure, for which take-off and landing are on foot, with the pilot (and potentially one passenger) carried in a harness (or harnesses) connected to the wing

2.2
model of paraglider
paragliders of different sizes of a given design are considered to be the same model when fulfilling the following criteria:

a) the different sizes have been obtained by using a uniform scale factor;

b) for all sizes identical materials are used;

c) the way materials are processed is identical for all sizes

2.3
identically constructed lines
lines where the only elements that differ are the finished line length and/or cosmetic colour

2.4
main control lines
entire line systems that terminate at the two primary control handles

2.5
significant damage
rupture of any of main load bearing component of the structure

3 Requirements

3.1 Shock loading

When tested according to 4.4, a visual inspection of the wing shall not show significant damage.

3.2 Sustained loading

When tested according to 4.5 the wing shall sustain 4.5.2. 1) or 4.5.2 2).

3.3 Breaking strength of the suspension lines

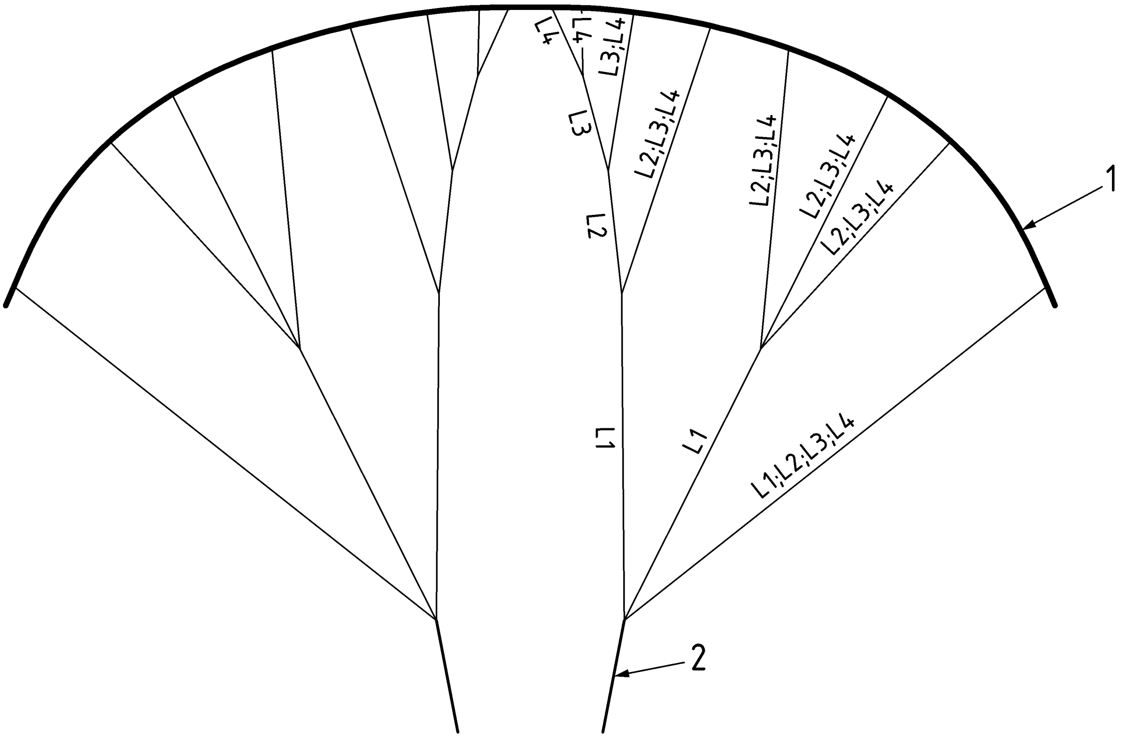
The lines shall be tested according to 4.6. If identically constructed lines have already been tested, then the result may be used.

The minimum breaking strength of any line shall be greater than 200 N. The first level is defined as the lines attached to the risers.

The sum of strength after bending test of the lines of the first level shall exceed the greater of 14 × g × [max weight in flight] or 14 000 N (g = 9,81 m/s^2).

For each level the same calculation is performed. The result shall exceed the greater of 14 × g × [max weight in flight] or 14 000 N (g = 9,81 m/s^2).

Subsequent levels (as shown in Figure 1) are defined by each further line junction. If a line is directly attached to the wing (i.e. no line junction above it), its strength shall also be used during the calculation of the strength of each of the level(s) above it. An example calculation is given in Annex A.



Key

1 Wings
2 Risers
L1 Level 1
L2 Level 2
L3 Level 3
L4 Level 4

Figure 1 — Example of line rigging

3.4 Breaking strength of the main control lines

The lines shall be tested according to 4.6. If identically constructed lines have already been tested, then the result may be used.

The sum of the strength of the lines of each level shall exceed 1 500 N (i.e. 2 × 750 N).

The minimum breaking strength of any line shall be greater than 200 N.

The first level is defined as the lines attached to the main control handle(s) including the control handle and the attachment of the line to the handle.

When a control handle is connected to a control line in the manner described in the user manual, the connection between the control handle and the first level of line shall have a minimum breaking strength of 750 N.

4 Test methods

4.1 Apparatus

4.1.1 Weak link

The weak link shall be chosen for instantaneous break at a load defined in Table 1 according to the total weight in flight:

Table 1 — Selection of weak link break loads

Total weight in flight (kg)	< 120	120 to 180	180 to 240	≥ **240**
Break load of the weak link (N)	8 000	10 000	12 000	14 000

The use of weak links with a tolerance of ± 5% is allowed. Weak links shall be protected against torsional load as recommended by the manufacturer.

For each additional 60 kg value above 240 kg total weight in flight, the break load of the weak link shall be increased by 2 000 N.

Where individual weak links of the specified values are not available, it is permissible to pair in parallel two identical weak links of half of the required value.

4.1.2 Cable

The shock test cable shall meet the following requirements:

— length: 125 m (±1%);

— minimum breaking strength: ≥ 50 kN;

— the elastic elongation at 5 kN shall be between 11,8 cm and 14,4 cm.

NOTE The elastic elongation is equal to 1,05 per thousand (± 10 %) at 5 kN .

4.1.3 Electronic sensor

An electronic sensor equipped with an electronic strain gauge for measuring the force (sampling a minimum of 10 times per second) is required for 4.5.

4.1.4 Measurement circuit

With a graph clearly showing the load (N) against time (s).

4.1.5 Video recording equipment

Video recording equipment shall be used to record the overall behaviour of the glider during the tests.

More than one camera may be used. .

4.1.6 Test vehicle

For the shock load test, a vehicle with a verified means of indicating ground speed to within ± 1 km/h, shall be used.

4.2 Test specimen

Select one test specimen that conforms to the manufacturing record for that model. This specimen is used for both test 4.4 and 4.5, first 4.4 and then 4.5. No changes to the specimen shall be made between the two tests.

Either:

a) every size of a particular paraglider design shall separately be tested or;

b) where different sizes meet the criteria of being the same model, then the size with the largest maximum total weight in flight is tested. In this case, the maximum total weight in flight for all the smaller sizes shall not exceed:

$$W_{\text{max}} = W_{\text{max tested glider}} \times 0{,}9$$

4.3 Test conditions

For the shock loading test in 4.4, the wind speed in the immediate vicinity of the glider shall be less than 4m/s.

4.4 Shock loading test

4.4.1 Principle

The paraglider is subjected to a shock load and the wing is then visually inspected for significant damage.

4.4.2 Procedure

Carry out the shock loading test using a weak link to limit the loads to a maximum force according to Table 1.

Place the paraglider vertically such that it is supported from close to the leading edge with the trailing edge in the centre touching the ground and the span fully extended. The number of supports shall be at least equal to the number of lines in the lowest section of the A lines.

The arrangement of the canopy shall be such as to minimize any slackness (looseness) in the material of the lower surface. The lines and risers shall be as straight as possible.

Connect the risers to the weak link and the latter to the cable defined in 4.1.2, whose other end is connected to the tow vehicle.

Fix the control handles to the normal position on the risers without pre-braking. .

Lay out the cable on the ground so that the test shock load can be applied almost instantaneously.

The tow vehicle shall attain a ground speed between 70 km/h and 75 km/h from the standing start before the cable becomes taut.

Continue until either:

a) the weak link breaks; or

b) 5 s has elapsed since the application of the shock load.

4.5 Sustained loading test

4.5.1 Principle

The paraglider is attached to a test vehicle and ‘flown’ whilst loads are measured.

4.5.2 Procedure

Attach the risers of the test specimen, (0,42 ± 0,02) m apart, to the electronic sensors on the tow vehicle.

A controller can be positioned on the tow vehicle in order to operate the paraglider control lines to stabilize the wing.

Record the test on video so as to show the behaviour of the paraglider under load.

Increase the speed of the vehicle as gradually as possible, enabling the controller to obtain satisfactory stabilisation of the flight path of the paraglider.

When the paraglider has stabilized, continue to increase the speed gradually until either:

1) the measured load exceeds a load factor of eight times the maximum total weight in flight recommended by the manufacturer, for a minimum cumulative duration of 3 s; or

2) five peaks separated by at least 0,3 s are obtained above ten times the maximum total weight in flight recommended by the manufacturer, in one run.

4.6 Line bending test

4.6.1 Principle

Three specimens of each line type (i. e. three specimens of each material and/or processing method), with the length between 0, 5 m and 0,55 m with loops on each end, used in the suspension line system are conditioned and then its breaking strength is measured.

4.6.2 Conditions

A line under a constant tension of 2 N ± 10% is bent back and forward around a cylinder (see Figure 2) the same diameter as the nominal diameter of the line given by the manufacturer of the line (± 0,1 mm) with a minimum of 0,7 mm. The centre point of the bend is to be aligned with the weakest point of the line. The minimum rotation required for a cycle is 350°.

A complete cycle shall take a maximum of 2 s (2 bendings).

After 5 000 complete bending cycles, the breaking strength of the test specimen is measured.

An example of the line bending process is shown in Figure 2.

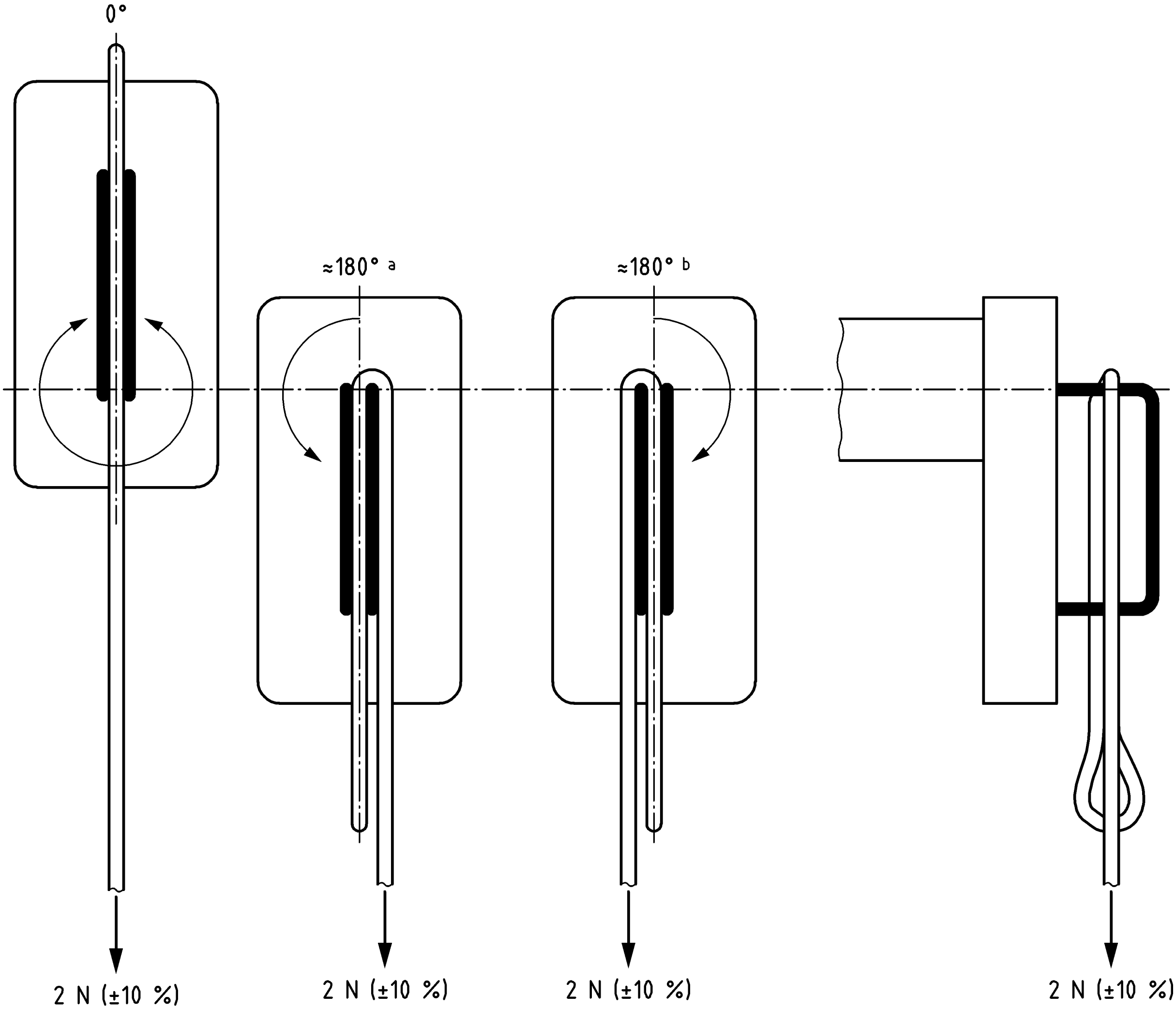


Figure 2 — Line bending test device

4.6.3 Procedure

Measure the breaking strength of the test specimen when loaded through the loops on each ends, using metallic connectors between 3 mm and 4,5 mm diameter.

The speed rate of the test device for applying the load shall be between 0,7 m/min and 1 m/min. For the calculation in 4.2, F_{break} is the lowest value out of the three test specimens measured.

A calibrated electronic sensor equipped with an electronic strain gauge for measuring the force (sampling a minimum of 100 times per second) is required.

5 Test files

5.1 Test file information

The test files shall include the following minimum requirements:

a) version of the current EN 926-1 standard;

b) the name and the address of the manufacturer;

c) the name and address of the person or company presenting the paraglider for testing (if different from manufacturer);

d) model and reference of the paraglider tested;

e) details of any significant damage after the test;

f) name and address of the testing laboratory;

g) results of the tests, i.e. values of loads in newtons and load times in seconds;

h) unique identifying test reference number.

5.2 Items accompanying the test files

The following items shall accompany the test file and be archived by the testing laboratory:

a) the video record of the tests;

b) the manufacturing record except where the identical paraglider has also been submitted for flight test of EN 926-2, in which case only one manufacturer record shall be archived;

c) the paraglider that has undergone testing except where the identical paraglider has also been submitted for flight test of EN 926-2, in which case only the flight tested sample shall be archived.

This documentation shall be archived for a minimum of 15 years and the tested paraglider for a minimum of 5 years.

6 Manufacturing record

The manufacturing record supplied by the manufacturer shall contain the following information:

a) name and address of manufacturer;

b) name and address of person or company presenting the paraglider for testing (if different from manufacturer);

c) name of model;

d) year (four digits) and month of manufacture of the sample tested;

e) minimum and maximum total weight in flight;

f) dimensioned and toleranced drawings;

The drawings are provided in an annex to the manufacturing record. They permit the suspension lines to be clearly seen and also give a plan view of all the components of the paraglider.

It is possible to provide these drawings on binary media (as long as their format is readable with standard office software), but the suspension lines and plan view drawings shall necessarily be on paper.

g) list of components and materials;

All the materials used shall be listed with:

1) name of the material;

2) name and references of the manufacturer;

3) its specific use in the paraglider;

4) characteristics and tests carried out on this material by the supplier or manufacturer.

7 Marking

Where a paraglider is submitted also to EN 926-2, this clause doesn't apply.

In the case of a paraglider tested to comply with EN 926-1 and not intended to be submitted for EN 926-2, the conformity of the paraglider to the requirements of this document shall be stated on a stamp or label permanently fixed to the canopy, which shall include the following information provided by the manufacturer:

a) manufacturer’s name;

b) name of person or company having presented the paraglider for testing (if different from manufacturer);

c) paraglider model name;

d) class of the paraglider. This entry shall only state "LOAD TESTED ONLY";

e) number and name of this document, i.e. EN 926-1, *Requirements and test methods for structural strength*, and issue date;

f) references to any other standards the paraglider is in compliance with;

g) year (four digits) and month of manufacture;

h) serial number;

i) minimum and maximum total weight in flight (kg);

j) paraglider weight (wing, lines, risers) (kg);

k) projected area (m^2);

l) number of risers;

m) inspections (whichever is earlier);

   1) number of (months);

   2) number of (hours flying time);

n) conformity tests carried out by (name and address of the testing laboratory);

o) unique identifying test reference number;

p) warning: Before use refer to the user's manual.

Annex A
(informative)

Suspension lines

Table A.1 presents a table calculation to be used with Figure A.1.

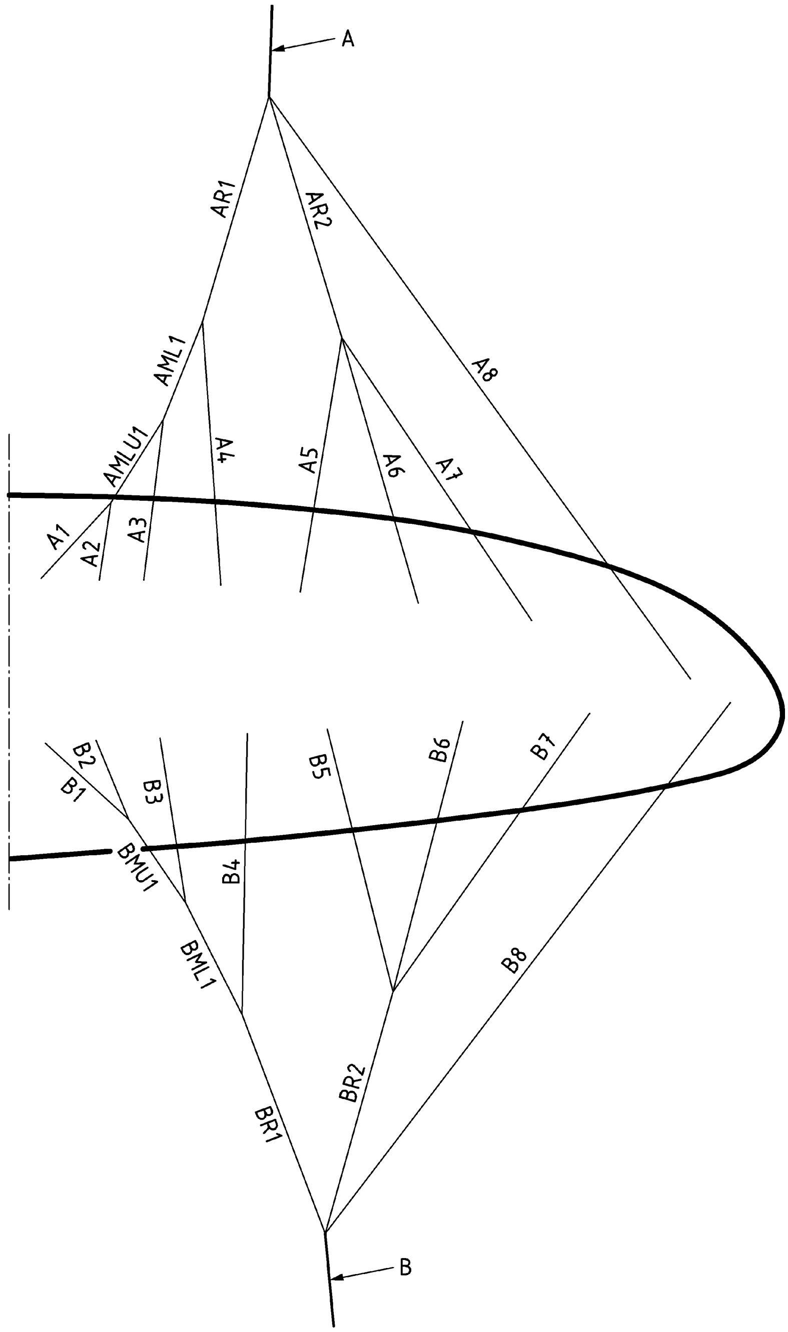


Figure A.1 — Example of calculation of rigging diagram

Table A.1 — Example of a calculation table of the suspension lines

Name	Reference	Break Value "New" (daN)	Break Value after bending test	Number of lines	Break value after bending use for level (DaN)			
					Level 1	Level 2	Level 3	Level 4
A1	9000U-090	90	48,6	2				97,3
A2	9000U-090	90	48,6	2				97,3
A3	9000U-090	90	48,6	2			97,3	97,3
A4	9000U-090	90	48,6	2		97,3	97,3	97,3
A5	9000U-150	150	81,1	2		162,2	162,2	162,2
A6	9000U-150	150	81,1	2		162,2	162,2	162,2
A7	9000U-150	150	81,1	2		162,2	162,2	162,2
A8	9000U-130	130	70,3	2	140,5	140,5	140,5	140,5
AMU1	TCT-130	130	56,5	2			113,0	
AML1	254UT-300	300	162,2	2		324,3		
AR1	7343-450	450	243,2	2	486,5			
AR2	7343-400	400	216,2	2	432,4			
B1	9000U-090	90	48,6	2				97,3
B2	9000U-070	70	37,8	2				75,7
B3	9000U-070	70	37,8	2			75,7	75,7
B4	9000U-090	90	48,6	2		97,3	97,3	97,3
B5	9000U-130	130	70,3	2		140,5	140,5	140,5
B6	9000U-130	130	70,3	2		140,5	140,5	140,5
B7	9000U-130	130	70,3	2		140,5	140,5	140,5
B8	9000U-090	90	48,6	2	97,3	97,3	97,3	97,3
BMU1	TCT-130	130	56,5	2			113,0	
BML1	254UT-300	300	162,2	2		324,3		
BR1	7343-400	400	216,2	2	432,4			
BR2	7343-400	400	216,2	2	432,4			
				Total of each level	2021,6	1989,2	1739,6	1881,1
				Weight in flight (daN)	125	125	125	125
				g factor	16,17	15,91	13,92	15,05

The g factor is calculated by dividing the total of each level by the weight in flight.

This example illustrates a failure as level 3 is too weak (less than 14 g). The dark cells are not applicable according to Figure A.1.