FAI Sporting Code

Fédération
Aéronautique
Internationale

Section 7G
CIVL Competition Class

Paragliders permitted in
FAI First Category Cross-Country events

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Editor's note: Hang-gliding and paragliding are sports in which both men and women participate. Throughout this document the words 'he', 'him' or 'his' are intended to apply equally to either sex unless it is specifically stated otherwise.

Contents

1 Introduction

This document defines the conditions in which paragliders are permitted to be certified as CIVL Competition Class (CCC) and flown in FAI First Category paragliding cross-country events. It is a reference for manufacturers, testing laboratories, organisers and pilots.

The CIVL Competition Class definition is scheduled for revision approximately every two years.

The CIVL Bureau can approve modifications outside of this regular revision cycle.

Any revision of the CCC rules does not apply retrospectively. Existing CIVL Competition Class certifications issued prior to the revision remain valid.

The purpose of the CIVL Competition Class rules is to permit safe, fair and satisfying competitions.

- Safe: the gliders perform very well even in turbulent conditions. It is CIVLs responsibility to ensure that the CIVL Competition Class rules do not encourage manufacturers or pilots to push the boundaries of their paragliders in pursuit of performance. It is the manufacturer's responsibility to ensure that the gliders they release are safe for pilots to compete on. It is the pilot's responsibility to ensure that his/her glider is maintained with the level of safety it had when the manufacturer released it.
- Fair: the aim is to provide a level playing field where pilots and manufacturers can compete fairly against each other. The simplification of CIVL Competition Class requirements and time set between when the paraglider is certified and when it is allowed in First Category events are seen as crucial ways to fulfil this aim.
- Satisfying: CIVL Competition Class gliders are performant and predictable flying machines, available in all sizes.

See Annexe C for a brief history of the CIVL Competition Class.

2 General definitions

2.1 CCC paraglider

A CIVL Competition Class paraglider is a paraglider whose specific model initial size has first been certified by a testing laboratory, then other sizes certified by linear scaling by a testing laboratory or by a manufacturer.

2.2 Other definitions

Model
A paraglider model is a paraglider design which exists in one or more sizes.

Size and MTOW
The size of a paraglider model is defined by its Maximum Take Off Weight (MTOW) range.

Initial size
The initial size of model is a paraglider whose MTOW is equal or lower than 95 kg and that is certified by a testing laboratory.

Testing laboratory
A testing laboratory, to be considered as approved by CIVL, must have performed a minimum of 3 full EN certifications according to EN 926-1 and 926-2 in the twelve months prior to any certification of CCC paragliders.

Linear scaling
Model sizes other than the initial size can be created by linear scaling of the initial size.

Test specimen
A test specimen is a paraglider used for certification of a paraglider model. A test specimen must conform in every aspect with the corresponding size produced apart from specific speed system range and collapse lines.

Load test specimen
A load test specimen is a test specimen used to test physical requirements only.

Flight test specimen
A flight test specimen is a test specimen used to test in-flight requirements only.

2.3 Paraglider design

A paraglider ‘design’ is characterised by:

- the canopy, including
  - plan form, both when laid out flat and its vertical projection when in flight
  - aerodynamic profiles
  - internal structure
  - number and positions of line attachment points
  - materials used for manufacturing
- the line set, including
  - total number of lines
  - number of furcation points between riser and canopy line attachment points
  - line materials used for manufacturing, not considering line diameter

- the riser set, including
    - distance of each line attachment point to the main carabiner attachment point
    - lengths and positions of all elements connecting two or more risers, apart from the carabiner attachment point
    - materials used for manufacturing load-carrying parts
- any other characteristics that are commonly seen as a distinguishing factor between two paraglider designs.

3 Requirements for CIVL Competition Class paragliders

3.1 General

To be certified as a CIVL Competition Class paraglider, a model test specimen must comply with the following set of requirements:

- Physical requirements
- In-flight requirements
- Documentation requirements

Model test specimens for flight and load tests shall be identical in every aspect.

3.2 Physical requirements

3.2.1 Canopy

CCC paragliders must be constructed in compliance with the 23G theoretical load test requirements. The structural strength of the load test specimen must be tested through shock load and sustained load tests.

3.2.2 Lines

The test specimen's line lengths correspond with the lengths documented in the user's manual of the corresponding size of the model, with a tolerance of +/- 10 mm.

The lines for all sizes must passthe23G theoretical line breaking strength test specified in section 8.3.

For the scaled sizes, the line lengths must correspond to the scaled dimensions from initial size with tolerance of +20 mm, -20 mm on the total length of each linked line measured from the riser to sail.

3.2.3 Risers

The maximum shortening of the frontmost risers relative to the rearmost riser through the accelerator is 140 mm (tolerance 5 mm). So that the models' accelerator system, when fully engaged, shortens the frontmost riser by 140 mm or less in relation to the rearmost riser (tolerance 5 mm), and the riser set is designed including physical limiter(s) to prevent any further shortening of the frontmost riser relative to the rearmost riser by pilot action (such as the application of excessive force).

For high-speed test flights on the flight test specimen, the risers are fitted with a limiter that fixes the maximum shortening of the frontmost risers relative to the rearmost riser to ≥ 100 mm.

The only technical means to alter airspeed in flight are the model's brake and acceleration systems. Specifically, there are no trim tabs, or any other devices present which can be used to alter airspeed in flight without maintained pilot input.

The test specimen's riser lengths, both at trim speed and when fully accelerated, correspond with the lengths documented in the user's manual of the model, with a tolerance of +/- 5 mm.

3.3 In-flight requirements

The flight test specimen passed the flight tests specified in Chapter 7.

Any existing EN 926-2 certification of the same test specimen implicitly satisfies the flight test requirement (Section7.4) for the test specimen.

3.4 Documentation requirements

It is the responsibility of the manufacturer to provide certification documentation and check that they are received and published.

Certification documentation for all sizes shall be completed according to Chapter 8 and Annexes A and B.

- For the initial size, the documentation is completed by the test laboratory.
- For all other sizes, the documentation is completed by the test laboratory or the manufacturer.

For each model size, the manufacturer shall provide the following documents:

- Certificate of Conformity (Annexe A)
- Measurement Report (Annexe B)

The certification documents are sent to CIVL and published on CIVL website according to the following process:

1. The manufacturer sends the model certification documents to the CIVL Administrator <civl_comps@fai.org> and President <civl-president@fai.org>
2. CIVL controls that the Annexes A and B are fully completed. If it is not the case, the Annexes are rejected and the manufacturer is informed. If it is the case, CIVL sends the Annexes to all manufacturers as listed by CIVL civl.pg.manufacturers@fai.org. The list of manufacturers is available on CIVL website.
3. The listed manufacturers have 7 days to check the documents and send comments to CIVL.
4. Passed this deadline, if no comments are received, the model is considered as certified. The final certification documents are published on CIVL website and the list of certified models updated.
5. If comments are received, the manufacturer of the model has 7 days to answer the comments and adjust if necessary.
6. The 2-3-4-5 process starts again until no more comments are received.
7. In case of unresolved issues, the CIVL bureau has 10 days to arbitrate. The Bureau decision is final and cannot be appealed. By choosing to certify their paragliders, manufacturers accept this condition.
8. If the arbitration is favourable, the paraglider is considered as certified.

Manufacturers are encouraged to anticipate and send the documents ASAP so time is given to the process to develop fully, especially in consideration to First Category events acceptability timeline.

3.5 Marking

The conformity of a paraglider to the requirements of this document must be stated on a stamp or label permanently fixed to the canopy, which must include the following information:

a. Manufacturer’s name
b. Paraglider model name
c. Paraglider model size indication
d. CCC document date of issue as per front page of this document (e.g. ‘May 1,2020 ’)
e. Harness chest strap dimensions (distance between the centre of the base of connectors) used during flight tests
f. Year (four digits) and month of manufacture
g. Serial number
h. Recommended minimum total weight in flight [kg]
i. Permitted maximum total weight in flight (top weight) [kg]
j. Paraglider weight (canopy, lines and risers) [kg]
k. Projected area [m^2]
l. Number of risers
m. Inspection periodicity: Number of hours/number of months (whichever occurs earlier)

4 Paragliders permitted in FAI Category 1 competitions

Any EN-certified paraglider is permitted.

Any CCC paraglider is permitted if the following conditions are fulfilled:

- Its model size range includes the initial size with MTOW of 95 kg or less certified by a testing laboratory and the size with MTOW of 125 kg or more certified by a testing laboratory or by the manufacturer.
- The certification documents are sent to CIVL and CIVL will forward it by email all manufacturers at the latest 60 days before the start of the competition (which is the day of the Opening ceremony). The process described in 3.4 then applies.

5 Measurement definition for certification

5.1 General

Main lines
Main lines are lines that are directly connected to the riser set and connected to the wing either directly or through one or several furcation points.

Main lines are labelled A, B, C, etc. for each span-wise plane of main lines, with the frontmost plane in direction of flight being A.

Main lines are numbered 1, 2, 3, etc. for each chord-wise plane of main lines, with the plane closest to the wing's centre being 1.

Main line count
The main line count of a paraglider canopy's chord-wise row of attachment points is the number of distinct main lines (not counting brake lines) that are connected, either directly or via furcation points, with any of that row's attachment points.

A paraglider model's main line count is given by the maximum main line count across all its chord-wise rows of attachment points.

Line group
A line group is defined as a set of lines connected to the canopy where all those lines are connected to main lines with the same number, either directly or through furcation points.

Identically constructed lines
Lines are identically constructed if the only elements that differ between them are line length and colour.

5.2 Canopy dimension measurements

Results: Measurements of Span, Chord A, Chord B, Trailing Edge length (see Figure 1)

Unit: Millimeter

Tolerance: +/- 2% for span measurement; +/- 1% for chord and trailing edge measurement

Tension:
a. Span and Trailing Edge measurements are conducted under tension of 5 daN in measurement direction
b. Chord measurements are conducted under tension of 1 daN in the measurement direction

Span is defined as the distance between the two outermost symmetrical attachment points that are closest to the rearmost span-wise internal band, provided that there are no stiffening elements, such as plastic, Mylar or tension tapes, outboard of those points. If there are stiffening elements then the span is measured to the outermost points on them that are closest to the rearmost span-wise internal band.

Trailing Edge length is defined as twice the distance between the outermost, rearmost attachment point and the trailing edge at the centre of the canopy (50% of span, same as rear measurement point for chord A).

Chord is defined by the distance between the trailing edge (held by a clip or sticky tape) and the farthest point on the leading edge (held by hand), without distorting the profile.

Chord A is defined as the chord length along the rib at the canopy centre (50% of span). If no rib is present at the canopy centre, then Chord A is defined as the chord length along the rib closest to the centre of the canopy centre (50% of span).

Chord B is defined as the chord length along the rib that is located halfway between the canopy centre and the canopy tip (75% of span). If no rib is present at the location halfway between canopy centre and the canopy tip, then Chord B is defined as the chord length along the closest rib towards the canopy centre from that location. Manufacturers are encouraged to clearly mark that rib to facilitate verification.

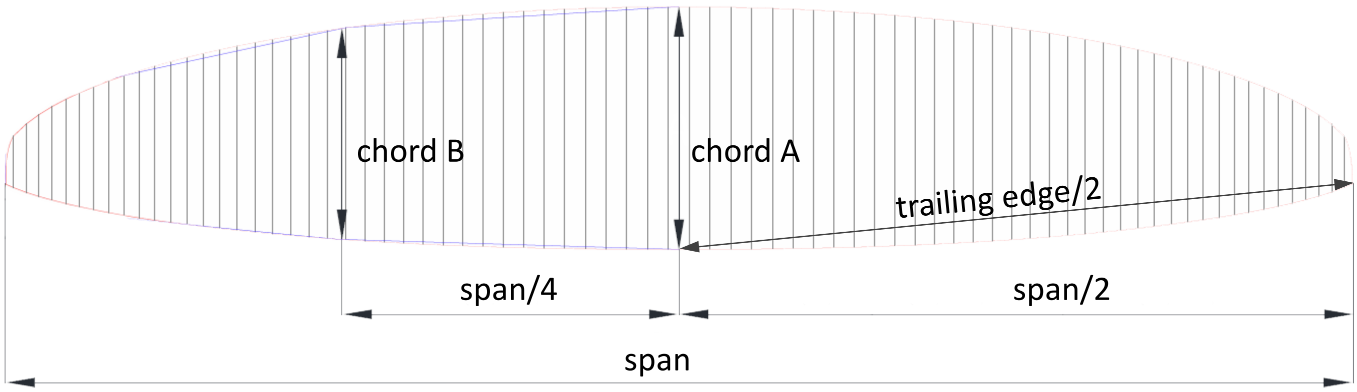


Figure 1: Canopy dimension measurements

5.3 Line attachment point measurements

Results:

a. Exact location of line attachment points described in the measurement file.
b. Photographic documentation of each different type of line attachment points used on the test specimen's canopy

Location definition: An attachment point's location is defined by the rib it is attached to, and its distance from the trailing edge.

Unit: span-wise location: rib number (counting from the wing centre); chord-wise location: Millimeter

Tolerance: none (span-wise); +/- 10 mm (chord-wise)

Tension: All measurements are conducted under tension of 1 daN in chord-wise direction

Procedure: For each line attachment point:

1. Record the rib number the attachment point is attached to (counting from the wing's centre)
2. Apply the defined tension to the rib determined in step 1, in chord-wise direction
3. Measure and record the distance from trailing edge to the attachment point along the rib to which the attachment point is connected. If the dimension of the attachment point in measurement direction is greater than 2mm, use the attachment point's centre point in measurement direction as its location.

5.4 Line length measurements

Results

Overall suspension line length for all attachment points on the canopy, from the canopy to the top of risers, maillon not included in the measurement. These measurements are required for the main suspension lines only. Brake line measurements are not required, and brake lines may be re-trimmed.

Unit: Millimetre

Tolerance: +/- 10 mm

Tension: All measurements are conducted under tension of 5 daN in the measurement direction.

5.5 *Riser set measurements*

5.5.1 Trim speed riser measurement

Results

a. For each maillon or other line attachment point, the distance between the inside of the maillon loop (the force transfer point between the attachment point and the line loops) and the inside of the main carabiner loop (the force transfer point between main carabiner and main attachment loop) at trim speed. See Figure 2a and Figure 2b.

b. The difference Δ_t in riser lengths between frontmost and rearmost riser.

c. Photographic documentation of the riser set in trim configuration

Unit: Millimetre

Tolerance: +/- 5 mm

Tension: All measurements are conducted under tension of 5 daN in measurement direction

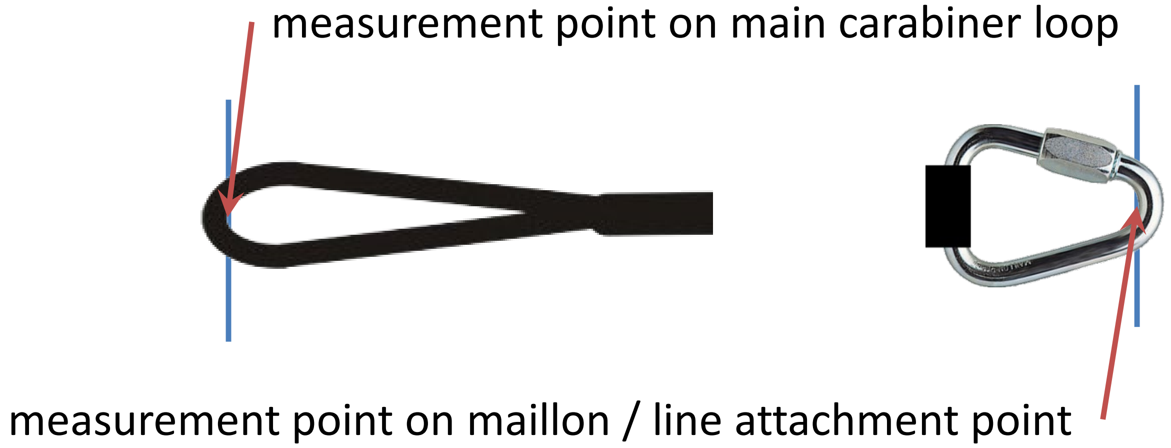


Figure 2a: Riser measurement points

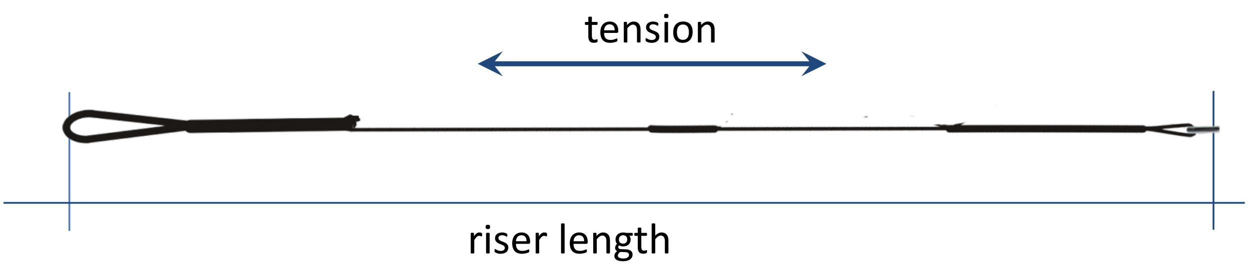


Figure 2b: Riser length measurement

Procedure:

1. Attach the riser set's main carabiner loop to a fixed point.
2. Apply 5 daN tension to each separate maillon or line attachment point on the riser set. This is done for all maillons or line attachment points at the same time, in the same direction.
3. For each maillon or line attachment point, measure and document the distance between the load-bearing surfaces on the main carabiner loop and the maillon/line attachment point.
4. Calculate the difference in riser length between (l_f) and rearmost (l_r) riser: $\Delta_t = l_r - l_f$. Fully accelerated riser measurement.

5.5.2 Fully accelerated riser measurement

Results:

a. For each maillon or other line attachment point, the length difference between the corresponding riser and the frontmost riser
b. The shortening of the frontmost riser in relation to the rearmost riser through acceleration
c. Establish that the riser set is designed in a way that prevents a change of relative riser lengths beyond 140 mm (tolerance 5 mm).
d. Photographic documentation of the fully accelerated riser set

Unit: Millimetre

Tolerance: +/- 5 mm

Tension: Unless otherwise stated, all measurements are conducted under tension of 5 daN in measurement direction

Procedure:

1. Attach the speed system line (or the top pulley if the line is not part of the riser) to a fixed point.
2. Apply 5 daN tension to each separate maillon or line attachment point on the riser set. This is done for all maillons or line attachment points at the same time, in the same direction.
3. Measure the distance Δ_a between the frontmost and the rearmost maillon or line attachment point. See 3 on the right, in this example, Δ_a= distance between B and A1.For this example, the B-limiter strap controls the riser travel, an A2 limiter line is not required.
4. Calculate the shortening of the frontmost riser in relation to the rearmost riser as follows: shortening $=\Delta_t+ \Delta_a$

5.5.3 Specimen risers

Paraglider flight test specimen has specific certification risers for accelerated flight. In order to perform fully accelerated riser measurement of each size during certification, additional separated specimen risers conforming in every point with the riser produced must be delivered together with the paraglider flight test specimen.

Trim speed riser measurement on flight test specimen's risers must be equal to trim speed riser measurement on specimen risers, tolerance +/-5 mm.

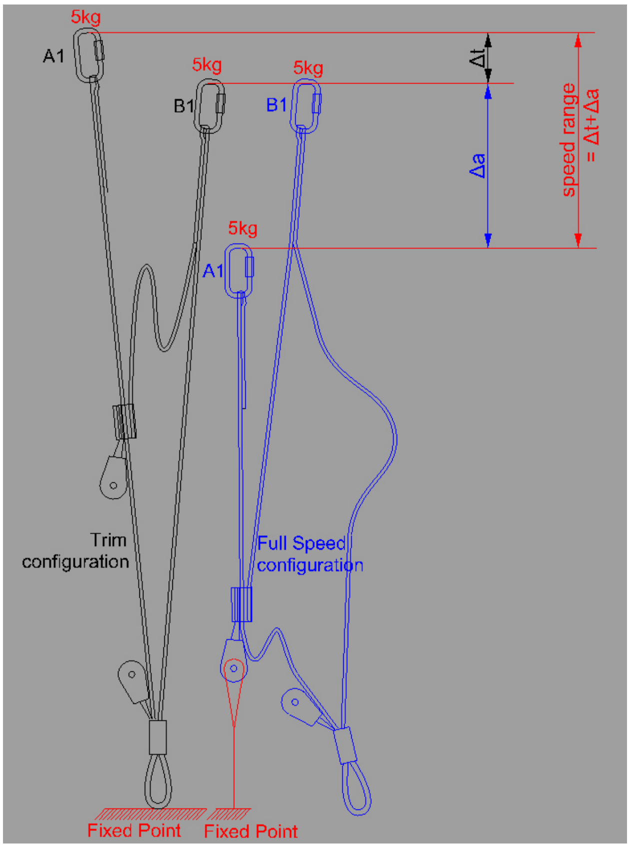


Figure 3: Fully accelerated riser measurement

6 Structural strength requirements[1]

6.1 General

All CCC wings must be constructed in compliance with the 23G theoretical load test requirements.

A shock load test and a sustained load test shall be done. If the load result obtained in one size is higher than the minimum load value of another size of the same model required by 8.2.3 and 8.2.4, and if this other size uses lines of same or bigger strength, this other size does not need a specific load test.

A specific shock test is still needed if the weak link used on the other size is not fulfilling the weak link minimum value.

6.1.1 Equipment

6.1.1.1 Weak link

The weak link shall be chosen for instantaneous break at a nominal load defined in Table 1 according to the total weight in flight. Weak link with higher nominal load can be used as well.

Table 1 only applies for weak links having breaking load precision up to +/-10%.

Minimum nominal weak link value (daN)	Maximum weight in flight (kg)
600	92
650	100
700	107
750	115
800	123
850	130
900	138
950	146
1000	153

Table 1: Weak link nominal values

6.1.1.2 Cable

The cable used for the test shall fit the following requirements.

- Length> 100 m
- Elongation between 1 kN to 5 kN <12 cm

The cable should not break during the test.

6.1.1.3 Electronic sensor

The electronic sensor used in the sustained load test must be equipped with an electronic strain gauge for measuring the force. The sampling rate is at least 5 Hz.

6.1.1.4 Measurement circuit

The measurement circuit used in the sustained load test must produce a graph clearly showing the load [N] against time [s].

6.1.2 Load test specimen

The load test specimen must be presented ready to fly and conform in all points to the production model, including production-grade lines (without loops or knots), production-grade riser sets.

[1] This section is based on the EN standard definition EN 926-1.

6.1.3 Shock load test

6.1.3.1 Principle

The test specimen is subjected to a shock load. The wing is then visually inspected for damage.

6.1.3.2 Procedure

1. Connect the risers to the weak link.
2. Connect one end of the cable to the weak link's free side.
3. Connect the cable's free end to the tow vehicle.
4. Lay out the cable on the ground so that the shock load can be applied almost instantaneously.
5. Place the test specimen 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 must be at least equal to the number of lines in the lowest section of the A lines.
6. Arrange the canopy such as to minimise any slackness (looseness) in the material of the lower surface. The lines and risers must be as straight as possible.
7. The tow vehicle accelerates to attain a ground speed of 70 km/h (tolerance +5 km/h/-0 km/h) from the standing start before the cable becomes taut.
8. Continue until either of the following applies:
   a. the weak link breaks
   b. the test specimen fails

6.1.3.3 Result

A visual inspection of the specimen shall not show significant damage. If this is the case, it is considered that the specimen passed the test.

6.1.4 Sustained load test

6.1.4.1 Principle

The test specimen is attached to a test vehicle and 'flown' whilst loads are measured.

The test specimen must sustain while tested according to 6.1.4.2.

6.1.4.2 Procedure

1. Attach the load test specimen's riser sets, 0.42 m apart, to the electronic sensors on the tow vehicle.
2. Positioned a controller on the tow vehicle, to operate the load test specimen's control lines to stabilise the wing.
3. Increase the speed of the vehicle as gradually as possible, enabling the controller to obtain satisfactory stabilisation of the flight path of the test specimen, keeping the load factor less than three times the maximum tested weight, as defined by the manufacturer.
4. When the load test specimen has stabilised, continue to increase the speed gradually until either of the following applies:
   a. The measured load exceeds a load factor of eight times the maximum tested weight, as defined by the manufacturer, for a minimum cumulative duration of 3s. Maximum tested weight [kg] = '3s sustained load' (N) divided by 8 divided by '9.81 m/s/s acceleration'.
   b. Five peaks separated by at least 0.3s are obtained above ten times the maximum tested weight, as defined by the manufacturer, in one run. Maximum tested weight [kg] = 'five-peak load'[N] divided by 10 divided by '9.81 m/s/s acceleration'.
5. Record the load graph and attained maximum tested weight[kg].

6.1.4.3 Results

1. A visual inspection of the specimen shall not show significant damage. If this is the case, it is considered that the specimen passed the test.
2. In the case of a successful test, the result of the sustained load test is the test specimen's maximum tested weight in kg. The test specimen fails the sustained load test if this value is less than the test specimen model size's top weight as specified in the user's manual.

6.1.5 Line breaking strength test

6.1.5.1 Principle

The test model size's top weight is compared with the theoretical breaking strength of the model size's complete line system (excluding brakes). The theoretical breaking strength is calculated based on the measured breaking strengths of samples of the line materials actually used for the model size and built using identical materials and splicing techniques.

The load calculation for testing the breaking strength of the line sets shall be applied to each size of the model, at the maximum flying weight of that model size.

6.1.5.2 Procedure

Any reference used in the line set must be tested properly according to the procedure below.

For new line materials and/or construction techniques line breaking strengths for the load calculation will be based on the tests of an independent testing laboratory. The paraglider manufacturer will provide samples of the lines to the testing laboratory with the sewn and/or spliced terminations. The testing laboratory shall test at least 10 samples of each type of line and will take the average load achieved from those 10 samples. The procedure is to measure the line samples' breaking force.

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. A calibrated electronic sensor equipped with an electronic strain gauge for measuring the force (sampling a minimum of 100 times per second) is required. For the subsequent calculation, F_{break} is the average value out of the ten measurements.

Principle: at each level in the line set the total strength of all supporting lines must be at least 23 times pilot weight.

For each level, calculate the test specimen's theoretical maximum take-off weight (Wmax, in kg) as follows:

$$W_{max} = \frac{\sum_i F_{break_i} \times n_i}{23g} \quad \text{where} \quad g = 9.81\ m/s^2$$

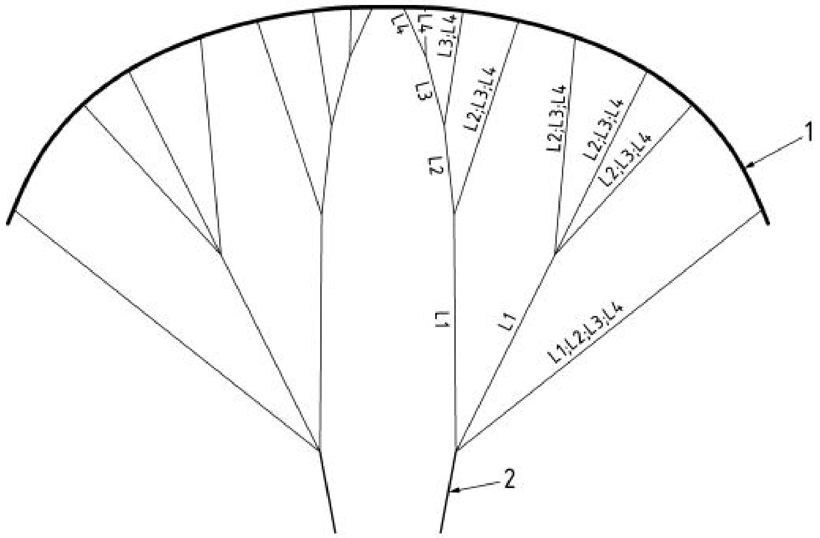
F_{break_i} is the breaking force of line type i used in the particular level.

n_i is the number of lines of line type i used in the particular level.

i.e. the sum of the breaking forces of all the lines in the particular level must be greater than 23 times maximum take-off weight.

Levels (as shown in Figure 4) 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.

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 4. Example of line rigging and corresponding levels.

The manufacturer will decide the load distribution between the different lines according to their own calculation. The line load calculation will be applied to all load-bearing lines of the glider, including the stabilo, but not the brake lines.

The absolute minimum strength, F_{break}, of any individual line, including the brake lines, must be equal to or greater than 20 daN.

A pilot may repair damaged lines by replacing them with identical lines or lines of greater strength.

The main brake line and all levels of brake lines must have a minimum strength of 100daN.

7 In-flight requirements[2]

7.1 Definitions

In the context of this section, the following terms and definitions apply.

Harness
Assembly composed of straps and fabric for supporting the pilot in a seated or semi-recumbent position. The harness is attached to the wing via two connectors.

Controls
Primary steering and speed controls which are designated as such by the manufacturer.

Accelerator
Pitch control mechanism operated by the feet which automatically returns to the initial position when the action of the pilot stops.

Action of the pilot
Any transfer of weight, action on the controls, the accelerator or on the trimmer.

Normal flight
Flight condition in which the paraglider is fully inflated and is following a trajectory close to straight flight (at a speed close to trim speed) without any action on the part of the pilot. A small number of cells may still be collapsed.

Spiral dive
Flight condition in which a paraglider is fully inflated follows a circling, steep, nose down trajectory. The pitch angle of 70° or more. The angle of the span relative to a horizontal line is between 0° and 40°.

Spontaneous recovery
Without any action on the part of the pilot, the paraglider returns to normal flight.

Cascade
Transition from one involuntary abnormal flight condition to another involuntary abnormal flight condition.

Certification limiter
A limiter built into the risers that limits the maximum A-B distance to ≥ 100 mm (with no negative tolerance – i.e. designed to limit maximum A-B travel ≥ 100 mm).

High-speed flight test speed
Tests carried out at the speed where the certification limiter is fully tensioned, used for the high-speed flight tests.

Minimum speed
Slowest airspeed maintainable without entering a deep stall or full stall.

Trim speed
Airspeed of the paraglider in straight flight without activating the controls or the accelerator.

[2]This section is based on the EN standard definition EN 926-2.

Maximum speed
Airspeed of the paraglider in straight flight with the controls in the zero position and the accelerator fully activated.

Low speed
Airspeed of the paraglider in straight flight with the controls at 50% of travel between the zero and the symmetric stall position (i.e. 50% of the symmetric control travel).

Folding lines
A set of lines, going from one riser to attachment points placed in front of the same wing side's or the opposite wing side's A line attachment points.

Weight in flight
Total weight (mass) of the pilot and his entire paragliding equipment (including the glider) ready to fly. For the purposes of this document masses are indicated in kg, rounded to the nearest integer value. The term 'weight' may be used instead of mass.

7.2 Equipment

7.2.1 Pilot equipment

The pilot performing the manoeuvres must be equipped with:

- System for adjusting the load in accordance with the manufacturer's requirements.
- Variometer with sink rate alarm set at -10 m/s.
- At least one on-board wide-angle camera, showing the entire wing, the risers and pilot's arms, and having a microphone to register the pilot manoeuvre's announcement and comments in flight.

7.3 Test specimen

A specific test specimen must be presented ready to fly and conform in all points to the production model, including production-grade lines production-grade riser sets and a user's manual in a language acceptable to the testing laboratory.

7.3.1 Marking

7.3.1.1 Marking for large asymmetrical collapses

The test specimen's canopy, on its intrados side, must be clearly marked in the following way on the wing half specified by the test laboratory (see figure 5.1).

Points A and B are illustrated on Figure 5.2 below. Point A is the apparent intersection between the leading edge folded and the trailing edge and Point B is the point where the leading edge starts to fold.

Marks must be contrasting and easily recognisable. All positions are percentages of the flat (i.e. non-inflated) span and are determined with the test specimen laid flat.

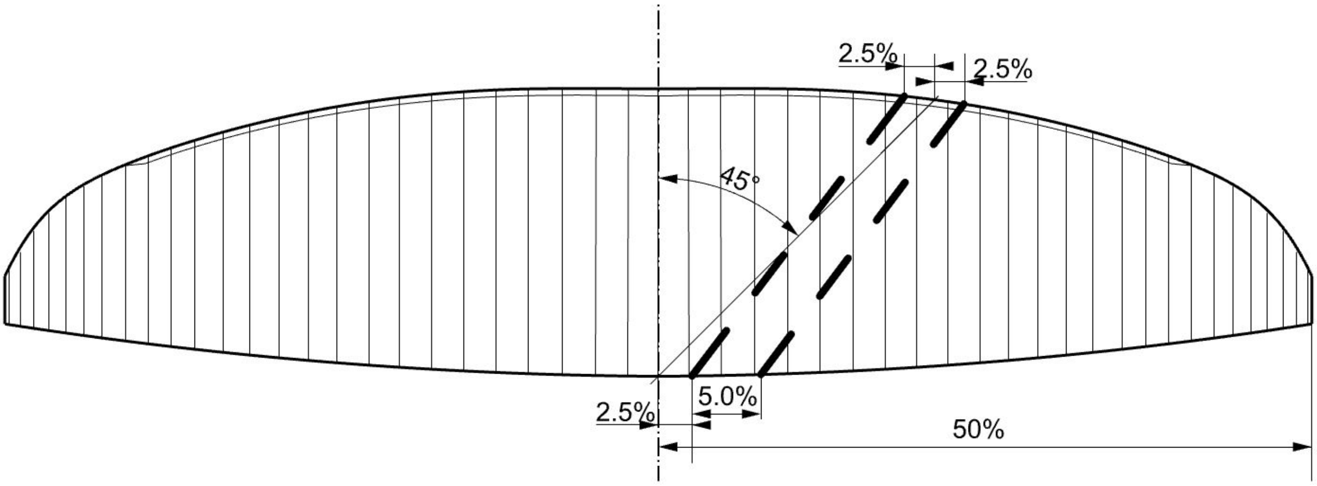


Figure 5.1: Canopy markings Control lines for large asymmetric collapses

To collapse the wing within this marking, the leading edge should be collapsed between the two leading edge marks and point A should be between the two trailing edge marks. Collapse shall be recorded with a camera situated on the pilot's knee.

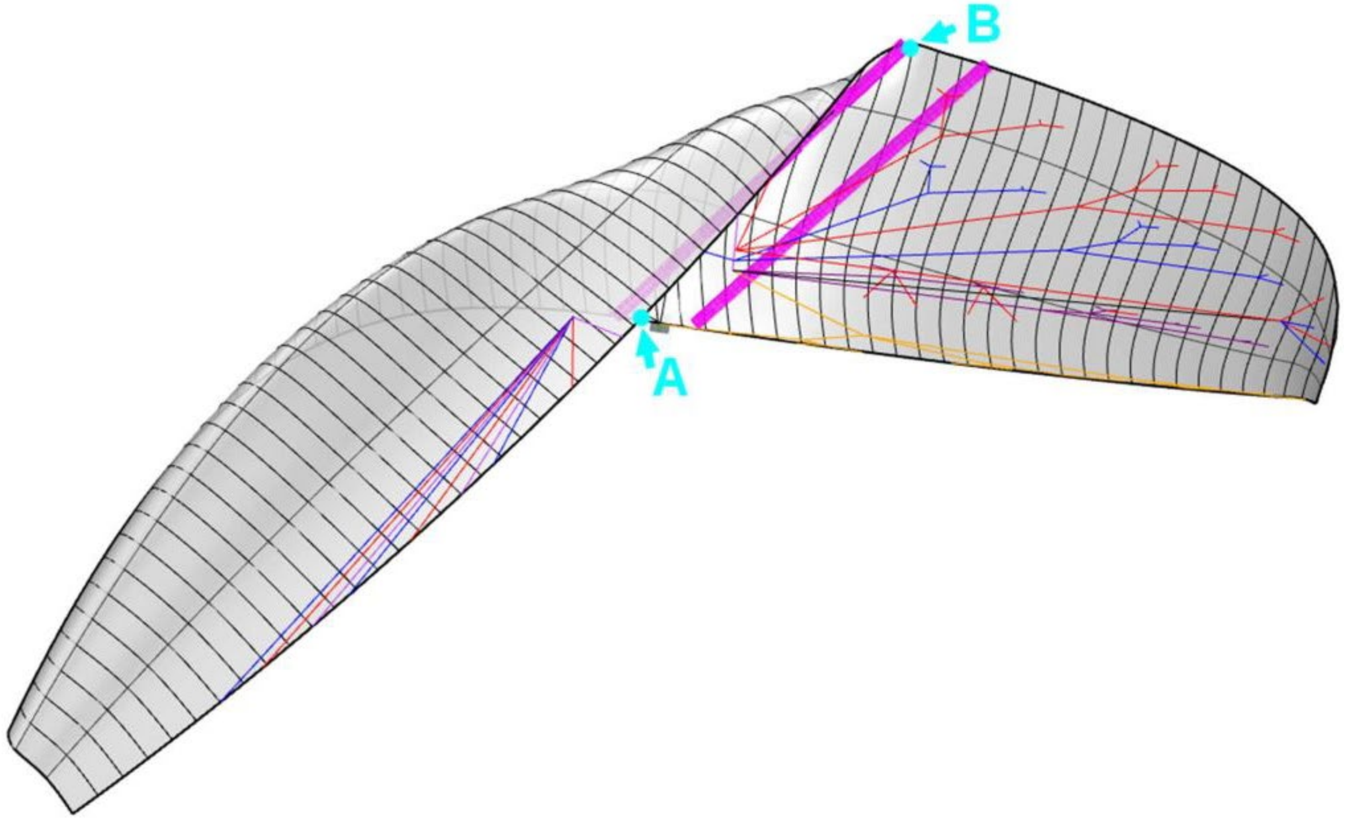


Figure 5.2: Points A and B illustration from the pilot's view

7.3.1.2 Marking for small asymmetrical collapse

The test specimen's canopy, on its intrados side, must be clearly marked in the following way on the wing half specified by the testing laboratory (see figure 5.3).

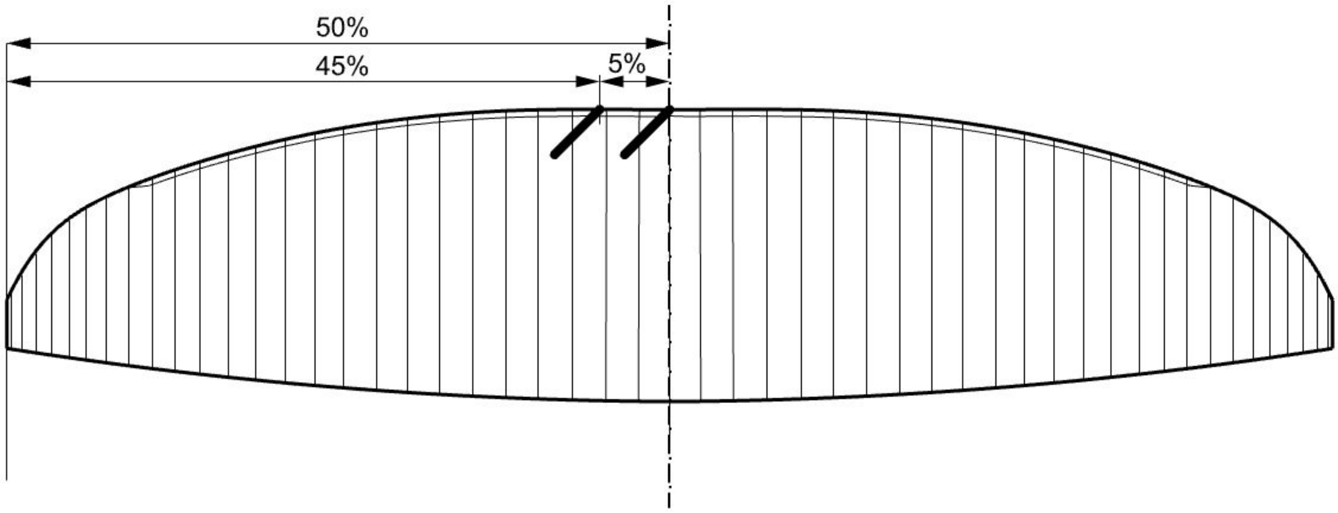


Figure 5.3: Canopy markings Control lines for small asymmetric collapses

7.3.1.3 Marking for symmetric frontal collapse

The test specimen's canopy, on its extrados side, must be clearly marked in the following way on two sides (see figure 5.4). Marks position are in percentages of the flat (i.e. non-inflated) chord and are determined with the test specimen laid flat.

To collapse the wing within this marking, the test pilot needs to visualise all marks on the extrados at the same time. Video recording may be used in order to check it properly when the action is too fast for pilot's eyes.

Marks must be contrasting and easily recognisable.

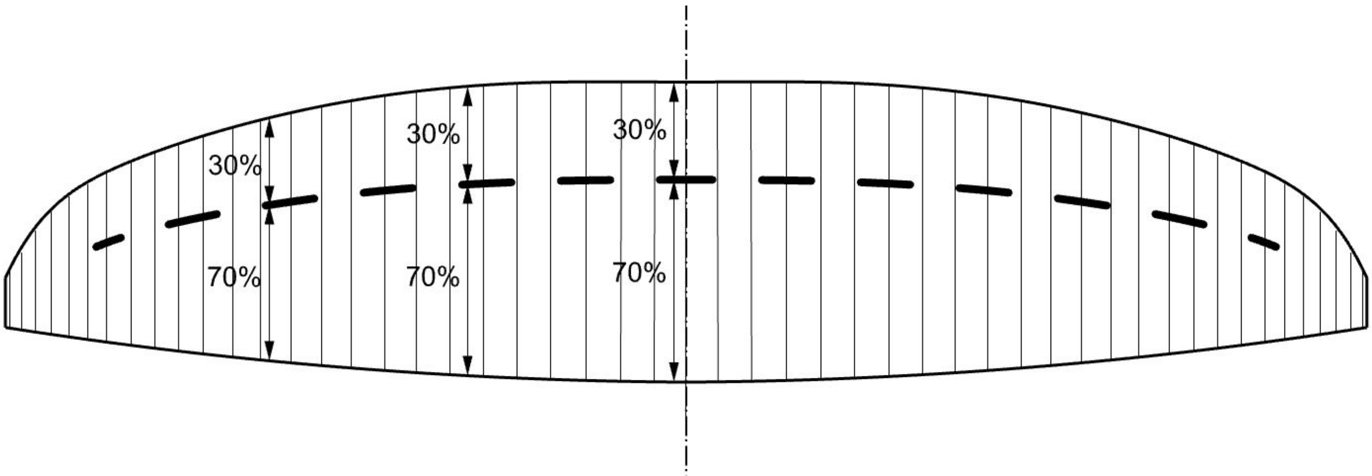


Figure 5.4: Canopy markings control lines for symmetric front collapses

7.3.1.4 Marking on control lines

Zero and symmetric stall positions must be marked on the control lines:

1. The zero position mark is placed at the position of the control lines at which the first action on any point of the trailing edge can be observed.
2. To mark zero and symmetric stall positions, it is recommended that manufacturers attach an additional reference line to each side of the test specimen, running from the B riser to the seat of the harness, and incorporating elastic to maintain tension. Each reference line should be fitted with 2 adjustable toggles.
3. When moving the controls to a position to be marked, the pilot moves both the controls and the appropriate toggles down.

7.3.1.5 Streamer

To help visualise the glide trajectory, a streamer 1 m long and 5 cm wide must be attached to a suitable line or riser.

7.3.2 Folding lines

If due to the geometry of a paraglider's suspension line system any type of deliberate folding as defined in 7.5 cannot be achieved in accordance with the procedure description, the manufacturer is required to attach additional lines, so-called folding lines, to the flight test specimen, in order to enable the pilot to perform these manoeuvres as specified. If folding lines are used, this must be noted in the test report, and full details included in the user's manual, including attachment positions and line lengths.

Two types of folding lines can be used: symmetric and asymmetric.

7.3.2.1 Symmetric folding lines

The folding lines are arranged in such a way that the resulting collapses match with the shape criteria defined in 7.5.

A folding line riser is a line or a webbing that is situated below the first split in several lower folding lines.

The diameter of the folding lines must not be greater than 1.5 mm except for the Folding line riser.

7.3.2.2 Asymmetric folding lines (also known as 'cross line')

Asymmetric folding lines can be used for the large asymmetric collapse tests only: 7.5.9 and 7.5.10.The setup consists of:

- riser
- bottom line
- top lines (if any).

The lower end of the bottom line is attached to the folding line riser (any suitable place) and its upper end can be attached directly to the canopy, or to symmetrical folding lines, or it may fork into 2 or 3 top lines attached to the canopy.

7.3.2.3 Folding line attachment points

Attachment points for folding lines must fulfil the following requirements:

1. All folding lines must be attached to the bottom of the canopy profile.
2. Folding lines must not be attached further backward than the corresponding top A lines.

7.4 Procedure

7.4.1 General

1. The initial size flight test specimen's behaviour in the programme of test manoeuvres defined in 7.5 is demonstrated by a manufacturer pilot in front of a test pilot of the test laboratory carrying out the flight tests.
2. If this demonstration is satisfactory to the test pilot, the actual test is carried out.
3. The test consists of execution of all the test manoeuvres defined in 7.5 at the maximum weight in flight declared by the manufacturer. The tests are executed by the test laboratory's test pilot. Where indicated in 7.4.3, the manoeuvre can be executed by a manufacturer pilot.
4. In cases where the initial size of the paraglider model has been tested by a test laboratory and has CIVL Competition Class Certification, other sizes of the same model may be produced by linear scaling from that wing. For those scaled gliders, the flight tests can be carried out by a manufacturer test pilot at the manufacturer's test site.
5. If a test manoeuvre has not been performed in precise accordance with its procedure in 7.5, the manoeuvre must be repeated. This may be due to an error of the test pilot or due to meteorological influences.

6. The flight test specimen fails the flight test if either of the following applies:
    a. As a consequence of any of the tests manoeuvres described in 7.5, any failure of any part or component of the test specimen occurs.
    b. Any of the test manoeuvres described in 7.5 fails

Otherwise the test specimen has passed the in-flight tests.

Remark: It is highly recommended that all test manoeuvres be carried out over water, and that appropriate safety measures are taken to pick up the pilot quickly in case of an emergency landing in the water.

7.4.2 Meteorological conditions

The following meteorological conditions must be met during the tests:

- Wind less than 20 km/h within the test perimeter
- No turbulence within the test perimeter disturbing the flight tests.

7.4.3 Tests possibly executed by the manufacturer pilot.

For the size with MTOW of 95 kg and less, the flight test should be performed by the test laboratory. If the test laboratory agrees and for the test manoeuvres listed in table 2, it is allowed that the test pilot is a manufacturer's pilot. In this case the following requirement apply:

- The tests are performed under direct observation of a test pilot from the test laboratory
- The correct execution of the tests is verified by the testing laboratory's test pilot through direct observation as well as inspection of all recorded video evidence if asked by the test laboratory.

For the scaled sizes, the test flights are to be performed by the manufacturer test pilot at the manufacturer's test site, and correct execution of the tests is to be verified by the manufacturer.

Section	Test manoeuvres	Test pilot	
		Initial size	Scaled sizes
7.5.1	Speeds in straight flight	TL	MF
7.5.2	Control movement	TL	
7.5.3	Pitch stability operating controls during accelerated flight	TL	
7.5.4	Symmetric front collapse test at trim speed	TL or MF	
7.5.5	Symmetric front collapse test at high speed	TL or MF	
7.5.6	Exiting deep stall (parachutal stall)	TL or MF	
7.5.7	High angle of attack recovery	TL or MF	
7.5.8	Recovery from a developed full stall	TL or MF	
7.5.9	Large asymmetric collapse test at trim speed	TL or MF	
7.5.10	Large asymmetric collapse test at high speed	TL or MF	
7.5.11	Maintained asymmetric collapse	TL or MF	
7.5.12	Quick descent spiral dive	TL	
7.5.13	Quick descent option in straight flight	TL	
7.5.14	Other flight procedure	TL	

TL: Testing laboratory pilot
MF: Manufacturer test pilot

Table 2. Tests possibly executed by manufacturer pilot depending on size

7.4.4 In-flight weight

The maximum in-flight weight declared by the manufacturer must not exceed the maximum weight in flight as determined by the strength test 6.1.3, 6.1.4 and 6.1.5.

The test weight in flight must be achieved using a single pilot.

All weights are subject to an acceptable tolerance of ± 2 kg.

7.4.5 Harness

The horizontal distance between riser attachment points (carabiners) is set by the manufacturer to what is suitable for the wing.

7.4.6 Ballast

Any ballast must be tightly attached to the pilot and positioned as close as possible to the centre of gravity of a pilot sitting in the harness not carrying any ballast.

The use of water ballast is recommended for safety reasons.

7.4.7 Pilot position

Unless the test procedure states otherwise, the pilot should adopt a normal upright sitting position, with feet perpendicularly below his or her knees.

7.4.8 Controls in hand

1. Unless the test procedure states otherwise, the pilot always holds the controls in his or her hands.
2. The term ‘releasing the controls’ means taking all tension off the control lines.
3. When the test requires no action on the trailing edge, instead of leaving the brake handle off, command extensions can be used for the sake of safety.

7.4.9 Wraps

The test pilot must never need to use wraps unless the test procedure requires this.

7.4.10 Timing when starting test measurements

In tests 7.5.6, 7.5.7, 7.5.9, 7.5.10, timing starts from the instant that the controls reach the zero position after the pilot releases them.

7.4.11 Timing when exiting stalled flight conditions

The glider is considered to have exited tests 7.5.6 and 7.5.7 when it reaches its furthest forward pitching point. If there is no noticeable pitching, the glider is considered to have exited any of these tests when the streamer reaches 45° to the horizon.

7.4.12 Pitch angles

Measurement is of the change of angle. A straight line taken from the leading edge at the centre of the canopy to the pilot’s buttocks is compared to the horizon before and after the manoeuvre.

90 degrees pitch angle is when the wing is on the horizon from the pilot point of view.

7.4.13 Keep course

A paraglider is considered to have kept its course throughout a test if it stays within 15° either side of its original course.

7.4.14 Twist

In tests 7.5.9 and 7.5.10, a twist has occurred when after 5 s or after a turn of 360° the pilot’s position still is rotated more than 180° relative to the glider’s flying direction.

7.4.15 Collapse on the opposite side

In tests 7.5.9 and 7.5.10, a collapse on the opposite side has occurred when less than 50% of the span of the test specimen’s leading edge is affected. If more than 50% of the span is affected, this is a considered a cascade.

7.5 Test manoeuvres

7.5.1 Speeds in straight flight test

Procedure:

Assess the riser configuration during stabilised straight accelerated flight with the certification limiter tight. This test can be done indoors.

Results: The test fails if the shortening distance is **not**≥ 100 mm with the accelerator activated so that the certification limiter is tight.

7.5.2 Control movement test

Procedure:

1. Check the zero position and the symmetric stall position reference marks.
2. Stabilise the test specimen in straight flight at trim speed.
3. Over a period of 5s gradually lower both controls to the symmetric stall position marks, being careful not to induce pitch oscillations.
4. Hold this position until the test specimen rocks back entering a full stall.

Results: The test fails if symmetric control travel is less than 35 cm.

7.5.3 Pitch stability operating controls during accelerated flight test

Procedure:

1. Stabilise the test specimen in straight flight at high-speed with the certification speed limiter tight.
2. Activate both controls symmetrically to 25% of the symmetric control range within 2 s.
3. Hold that position for 2 s.
4. Slowly release both controls.

Results: The test fails if a collapse occurs during this manoeuvre.

7.5.4 Symmetric front collapse test at trim speed

Procedure:

1. Stabilise the glider in straight flight at trim speed.
2. Release the controls
3. By abruptly pulling the appropriate lines or risers, induce a symmetric front collapse over the entire leading edge with as little as possible, but at least 30% of the centre chord affected. As soon as the collapse is achieved, let go of the lines/risers.
4. If the test specimen has not recovered spontaneously after 3 s act on the controls to recover (without inducing a deliberate stall).

Results: The test fails if recovery through pilot action does not occur within the first 3s of pilot action

7.5.5 Symmetric front collapse test at high speed

Procedure:

1. Stabilise the glider in straight flight at high speed with the certification limiter tight.
2. Release the controls
3. By abruptly pulling the appropriate lines or risers, induce a symmetric front collapse over the entire leading edge with as little as possible, but at least 30% of the centre chord affected. As soon as the collapse is achieved, let go of the lines/risers.
4. If the test specimen has not recovered spontaneously after 3 s act on the controls to recover (without inducing a deliberate stall).

Results: The test fails if either of the following applies:

a. Recovery through pilot action does not occur within the first 3s of pilot action
b. After the exit, the test specimen dives forward more than 90°

7.5.6 Exiting deep stall (parachutal stall) test

Procedure:

1. Slow down the test specimen, using the controls, to obtain a trajectory as close as possible to the vertical without significantly changing the shape of the wing (deep stall). If a deep stall cannot be achieved due to a very long control travel, the pilot takes wraps to shorten the control lines.
2. Once a deep stall is achieved, maintain it for 3s.
3. Release the controls smoothly and gradually (in about 2 s) to the zero position.
4. If the glider has not recovered spontaneously in 3s, act on the controls to recover, in accordance with the user’s manual.

Results: The test fails if either of the following applies:

a. Recovery does not occur within 3s without pilot action
b. The dive forward on exit is greater than 90°
c. A cascade occurs

7.5.7 High angle of attack recovery test

Procedure:

1. Attain a trajectory as close as possible to the vertical (deep stall), without activating the controls or the accelerator, and with the minimum amount of deformation of the canopy (usually by using the minimum necessary pull-down of the B-risers).
2. Maintain this high condition for 3s.
3. Then release the risers slowly, symmetrically and continuously.
4. If the glider has not recovered spontaneously in 3s, act on the controls to recover, in accordance with the user’s manual.

Results: The test fails if either of the following applies:

a. Recovery through pilot action does not occur within the first 3s of pilot action
b. A cascade occurs

7.5.8 Recovery from a developed full stall test

Procedure:

1. Stabilise the glider in straight flight at minimum speed.
2. Fully apply the controls and hold that position until the test specimen is in a maintained full stall. If a full stall cannot be achieved due to a very long control travel, the pilot takes wraps to shorten the control lines.
3. Release the controls slowly and symmetrically until the canopy has approximately regained its inflated span.
4. Quickly and symmetrically fully release the controls in a period of 1 s. If the canopy’s pitch oscillations don’t die out, fully released the controls when the canopy, rocking forward, arrives above the pilot.

Remark: If an asymmetric collapse occurs, it is assumed that the release has not been sufficiently symmetrical, and the test manoeuvre should be repeated.

Results: The test fails if either of the following applies:

a. The dive forward on exit is greater than 90°
b. A cascade occurs

7.5.9 Large asymmetric collapse test at trim speed

Procedure:

1. Stabilise the glider in straight flight at trim speed.
2. Release the control handle on the side to be collapsed and attach it to the riser. Control extensions are allowed for safety provided they do not affect the trailing edge during the test.
3. Pull down the appropriate lines on one side as fast as possible to collapse the canopy asymmetrically inside the tolerance field in accordance with 7.3.1.1.
4. As soon as the collapse is achieved, release the lines quickly.
5. Take no further action and remain passive until the glider either recovers or 3s elapses.

6. If the glider has not recovered, act to recover the glider.

Results: The test fails if either of the following applies:
a. Re-inflation through pilot action does not occur within the first 3s of pilot action
b. A twist occurs
c. A cascade occurs

7.5.10 Large asymmetric collapse test at high speed

Procedure:
1. Stabilise the glider in straight flight at high speed with the certification limiter fully tight.
2. Release the control handle on the side to be collapsed and attach it to the riser. Control extensions are allowed provided the trailing edge is not affected during the test.
3. Pull down the appropriate lines on one side as fast as possible to collapse the canopy asymmetrically inside the tolerance field in accordance with 7.3.1.1.
4. As soon as the collapse is achieved, release the lines and the accelerator quickly.
5. Take no further action and remain passive until the glider either recovers or 3 s elapses.
6. If the glider has not recovered, act to recover the glider.

Results: The test fails if either of the following applies:
a. Re-inflation through pilot action does not occur within the first 3 s of pilot action
b. A twist occurs
c. A cascade occurs

7.5.11 Directional control with a maintained small asymmetric collapse test

Procedure:
1. Stabilise the glider in straight flight at trim speed.
2. Release the control handle on the side to be collapsed and attach it to the riser.
3. Pull down the appropriate lines on one side as fast as possible to collapse the canopy asymmetrically at approximately 45% to 50% of the leading edge and hold the collapse.
4. Attempt to keep the course for a period of 3 s, using the control on the inflated side if necessary.
5. From straight flight, further use this control to turn 180° to the inflated side in a period of 10 s without involuntarily entering an abnormal flight condition.

Remark: The pilot must not counteract inertia effects on his or her body at any stage.

Results: The test fails if the pilot is unable to keep course or perform the 180° turn.

7.5.12 Ability for quick descent spiral dive

Procedure:
Make a spiral dive with a vertical speed of at least -10 m/s maintained at least two turns following the technique described in the test specimen's manual. The test pilot can use the alarm set on the variometer as help to check vertical speed reached.
Use pilot action if necessary, to exit spiral.

Results: The test fails if it's not possible to reach this vertical speed. The test pilot should comment about the glider behaviour during the -10 m/s (unstable, neutral or stable; stable being that the paraglider tends to exit by itself).

7.5.13 Quick descent option in straight flight

Procedure:
1. Check whether at least one flight procedure for a quick descent in straight flight is described in the user's manual.
2. Verify that the described quick descent option can be flown safely.

Remark: This requirement may be satisfied by the manufacturer producing suitable and acceptable evidence (e.g. video).

Results: The test fails if any of the following applies:

a. No flight procedure for a quick descent in straight flight given in the user's manual
b. Procedure for quick descent in straight flight does not work as described
c. A cascade occurs during execution of the quick descent flight procedure

7.5.14 Testing any other flight procedure and/or configuration described in the user's manual

Procedure: Verify that every so-far untested flight procedure and/or configuration described in the user's manual can be flown safely.

Remark: This requirement may be satisfied by the manufacturer producing suitable and acceptable evidence (e.g. video).

Results: The test fails if any of the following applies:

a. A flight procedure does not work as described
b. A cascade occurs during execution of a described flight procedure

7.6 Test report

The test report must include the elements specified in Annexe A.

8 Documentation requirements for certification

8.1 Basic requirements

Each size of each model must produce a certificate of compliance and a measurement report.

- The certificate of compliance must use the template defined in Annexe A.
- The measurements report must follow the template defined in Annexe B.

The load and flight test specimen are archived for a minimum of 5 years.

8.2 User's manual

The user's manual shall be written in English. It shall be available online and distributed with each model sold. It can be provided in electronic form, provided the format is readable with standard office software.

Its contents shall cover at least the following:

1. General information
   a. Paraglider model name
   b. Manufacturer's name and address
   c. Recommended minimum total weight in flight (in kg)
   d. Permitted maximum total weight in flight (top weight, in kg)
   e. Maximum symmetric control travel at top weight (in cm)
   f. Introduction to the intended use of the paraglider
   g. Description of the paraglider's flight characteristics
   h. Version and date of issue of the user's manual
2. Manufacturer's recommendations on the levels of pilot skills required for safe operation.
3. Dimensions, illustrations and technical characteristics
   a. Overall illustration identifying all components essential for operation
   b. Canopy dimensions: chord length at wing centre, chord length at 25% of span, span, and trailing edge length
   c. Line attachment points diagram
   d. Projected area
   e. Number of cells
   f. Number of risers
   g. Dimensional drawings of the riser set, including lengths of all risers (distance between main carabiner loop and each maillon or line attachment point) both in trim and fully accelerated configuration. The length and configuration of the certification limiter (that limits riser travel to between 100 mm and 105 mm for high-speed flight tests) must be clearly specified. The length and configuration of the full-speed limiter (that limits maximum riser travel to 140 mm, tolerance 5 mm) must be clearly specified.
   h. Description of any adjustable, removable or variable device, besides controls and accelerator, with information on adjustment limits (if applicable). If no such device is present, this fact must be clearly specified.
   i. Dimensional drawings or table of all suspension lines including control lines and any additional lines used for flight testing such as collapse lines. Dimensions must include both individual section lengths (including the line material used for each section), and the overall lengths measured from the attachment points on the canopy to the inside edge of the maillon connecting them to the risers. Line lengths must be specified when measured according to 7.3.
   j. Technical data on all suspension lines materials: Manufacturer, manufacturer's code, diameter, core material, sleeve material, specified breaking strength.

4. Manufacturer's recommendations on all necessary piloting techniques. In particular, these recommendations must describe and specify:
    a. Harness dimension used during testing
    b. Pre-flight inspection procedure
    c. Normal piloting techniques, including the procedure for laying out the wing before inflation/take-off
    d. Use of accelerator and any other devices
    e. Recovery from involuntary abnormal flight conditions (deep stall, asymmetric collapse, etc.)
    f. Rapid descent procedures
    g. Procedure for steering in case of failure of the primary controls
    h. Any other special flying procedure and/or configuration the manufacturer suggests applying
    i. Any recommendations and special considerations regarding SIV. In particular:
        i. If folding lines were used for the flight tests, the manual must give information on how to obtain a set of folding lines
        ii. Instructions on how to correctly mount and dismount folding lines

5. Repair and maintenance instructions; in particular, these instructions must describe and specify:
    a. General information on maintaining and repairing the paraglider
    b. Recommended frequency of inspections in months from purchase or accumulated hours flying time (whichever comes first)
    c. Instructions for line measurements, re-trimming and replacements
    d. Detailed instructions on any repair and maintenance procedures that can be performed without special knowledge or special machinery
    e. List of spare parts and information how to obtain them

9 Verification during competitions

These measurements and testing procedures may be applied during competitions. Alternate or additional measurements may be chosen at the discretion of the Meet Director.

These measurements also provide pilots with a simple way to verify their wing's conformity.

9.1 Line attachment point

Visual comparison of all line attachment points on the paraglider's canopy with the photographic documentation of the line attachment points shows no difference in design, construction nor materials used.

9.2 Line length

The overall line lengths are measured and recorded. To speed up the measurement process, the complete length from main carabiner loop to attachment points may be measured, and the riser lengths deducted afterwards.

Brake lines are not measured.

9.2.1 Relative line length: Angle of attack test

1. The length from the carabiner end of the riser to the sail is measured at each line attachment point.
2. For each line group (groups based on lower main lines: A1, A2, A3; B1, B2, B3 etc.) the average line length is calculated.
3. For each line group the difference between the average A line length and the B line length is calculated. (A1 – B1, etc.). The wing passes if the difference between average A line length and average B line length matches the value specified in the manual with tolerance +2 cm/-2 cm.
4. The glider fails if it is trimmed fast>-2 cm. If the glider is trimmed slow>+10 mm the pilot should be warned that the glider is out of trim and potentially unsafe.

9.2.2 Relative line length: Camber test

This verification only applies to gliders with 3 or more lines chord wise.

The tests performed in 9.2.1 are repeated for each of the B and C line groups (groups based on the lower main lines: B1, B2, B3; C1, C2, C3 etc.) to confirm that as well as the A-B differences, the difference between B and C groups matches the values specified in the manual +2cm/-2 cm.

9.2.3 Absolute line length verification: Arc test

For each line attached to the tested paraglider's canopy, calculate the difference between the nominal overall length given in the paraglider's user's manual and the actual measured overall length. The glider fails if both lines of three or more symmetric line pairs differ from the manual nominal line length, with tolerance +5 cm/-5 cm.

9.3 Riser length

For each riser, the riser length is measured in the unaccelerated state, and under full acceleration. The glider passes if the difference in length between the accelerated and trim state is restricted to 140 mm with tolerance +5 mm.

9.4 Line quality

A paraglider passes verification if its line quality is identical the ones listed in Annexe B.