



# CIVL Paragliding Committee

*Fédération  
Aéronautique  
Internationale*

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## CIVL Competition Class (CCC)

### Paragliders permitted in FAI Category 1 Cross-Country events

**2018 Edition  
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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.

## **FEDERATION AERONAUTIQUE INTERNATIONALE**

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# 1 Introduction

This document defines the paragliders permitted to be flown in FAI Category 1 paragliding cross-country events. Its purpose is to serve as a reference for manufacturers, testing laboratories, competition organizers and competition pilots.

Section 2 of the document shows the timeline which will result in the definition coming into effect, and how future revisions will be handled. Section 3 lists the goals that served as the foundation for the definition of the CIVL competition class paragliders. The CIVL competition class itself is defined in sections 4 and 5. Section 6 then specifies the gliders which will be allowed in FAI Category 1 competitions from 2018: Both EN and CIVL competition class certified gliders, as long as they fulfil certain requirements.

Section 7 through 10 describe the dimensions, measurements and testing and procedures for CIVL Competition Class certification. Section 11 finally gives the measurement and testing procedures for verification during competitions.

The purpose of the CCC rules is to permit safe competition. In some aspects (notably line strength) performance and safety are in conflict (reducing line diameter reduces drag). The CCC rule attempts to provide a level playing field where pilots and manufacturers can compete fairly against each other with gliders with a reasonable minimum level of safety. It is CIVL's responsibility to ensure that the CCC rules do not encourage manufacturers or pilots to push the boundaries of safe paraglider design in pursuit of performance: CIVL has to set the boundaries with the CCC rules.

It is the manufacturer's responsibility to ensure that the gliders they release are safe enough for pilots to compete on.

It is the pilot's responsibility to ensure that their glider is maintained with at least the level of safety it had when the manufacturer released it.

## 1.1 *CIVL Competition Class summary*

The CIVL Competition Class definition can be summarized as follows:

1. EN certification (EN 926-1 and EN926-2) is used as the basis but with modifications:
2. Additionally restrict top speed by limiting the accelerator effect to 14cm maximum.
3. Additionally require riser sets with a mandatory 140mm limiter (5mm tolerance).
4. Require all CCC gliders to pass the 23G theoretical load test, minimum line strength 20daN, minimum main brake line strength 100daN.
5. Forego flight tests that are irrelevant to this class of gliders
6. Require the relevant flight tests to be performed and/or assessed by an independent accredited test organisation on a glider with maximum take-off-weight 95kg and permit manufacturer self-certification of other sizes of the glider designed by linear scaling from that glider.
7. Set the waiting time until pilot input for collapse tests to three seconds
8. Set the time permitted after pilot input until glider recovery to maximum 3 seconds
9. Require flight tests to be conducted at the top of a wing's weight range.
10. Require flight tests to be conducted at trim speed and at a set higher speed defined by a certification limiter that restricts maximum riser travel to between 100mm. and 105mm.
11. Require the user's manual to contain additional information on the paraglider's operation and maintenance
12. Add clear, precise and simple-to-follow dimensions, measurements and testing procedures to verify a wing's conformity with certification

Additionally, in order to be allowed in an FAI Category 1 event, the documentation from the independent test organisation confirming the certification and dimensions of the 95kg model must be with CIVL competitions coordinator 90 days before the start of the FAI Category 1 event. Documentation for the other manufacturer self-certified sizes derived by scaling from that MTOW 95kg wing must be with CIVL competitions coordinator at least 60 days before the start of the FAI Category 1 event. All sizes of wing must be available to competitors at least 30 days before the event. To be eligible to compete in a Category 1 event the size range must include at least the MTOW 95kg wing and a wing with a maximum take off weight of 125kg or greater.

## **2 Timing**

February 2018 the CIVL Plenary voted unanimously to accept the proposed revision of the CIVL Competition Class definition.

May 2018: The definition becomes effective. The CIVL Competition class definition is scheduled for revision approximately every two years. For safety reasons, the CIVL Bureau can approve modifications outside of this regular revision cycle.

### 3 Goals

The definition of Competition Class paragliders was created with the purpose of World and Continental Championships in mind: safe, fair and satisfying contest flying. This led to the following goals for the class definition:

1. Safety –
  - a. wings complying with this definition are safe enough for adequately trained competition pilots in competition conditions
  - b. a wing's conformity with certification can be verified by simple measurements
2. Fairness –
  - a. ensure that wings are available for a wide range of pilot weights
  - b. prevent pilots from gaining an undue advantage over others through temporary or permanent modification of their glider
3. Satisfaction –

Wings complying with this definition should provide a satisfactory flying experience to the world's best competition pilots

## 4 Definitions

### 4.1 *Paraglider*

- §4.1 A paraglider is defined by Section 7B of the FAI Sporting Code as a class of “hang glider”. Its main components are the canopy, the suspension lines (short “lines”), and the riser sets.
- §4.2 The canopy is the aerodynamic portion of a paraglider, the wing. A defining characteristic separating paragliders from other classes of hang glider is that the paraglider is soft and light enough to be folded into a rucksack so it can be carried up a mountain and launched by one person unaided.
- §4.3 The suspension and brake lines connect the canopy with two riser sets, one for the left half of the canopy, one for the right half of the canopy.
- §4.4 A riser set consists of one or several individual risers, which each connect a subset of the suspension lines to the pilot harness’ main carabiners. A riser set can include an acceleration system.
- §4.5 A riser is typically a piece of webbing fitted with a line attachment point and connected either directly or through additional webbing structure to the pilot harness’ main carabiners.
- §4.6 The acceleration system is typically a pulley system that is operated by the pilot’s legs and modifies individual riser lengths to decrease the canopy’s angle of attack when activated. It is characterised by its maximum travel.

### 4.2 *Paraglider design, model and size*

- §4.7 A paraglider design (short “design”) is characterised by:
- the canopy, including
    - planform, 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
- §4.8 A paraglider model (short “model”) is an instance of a paraglider design which exists in one or more sizes, and where those sizes have been obtained by scaling.
- §4.9 A paraglider model size (short “size”) is an instance of a paraglider model, sized for a specific total take-off weight range. It is characterised by
- its canopy dimensions
  - its line dimensions, both length and diameter
  - its acceleration system’s maximum travel
  - its maximum allowed total take-off weight (short “top weight”)



- its recommended minimum total take-off weight

### **4.3 CIVL Competition Class paraglider**

- §4.10 To be a CIVL Certified Competition Class paraglider a specific individual model and size of paraglider must have been tested and shown to comply with all the certification requirements defined in section 5 of this document. For an individual size compliance must be determined by an accredited independent test organisation. Manufacturer self-certification is permitted for sizes of an individual model derived by linear scaling from a certified size S (maximum take off weight 95kg or less) of that model as defined in section 5 of this document.
- §4.11 A manufacturer's production paraglider that is identical in all characteristics listed in §4.7 and §4.9 to a specific model and size of CIVL Competition Class paraglider and has the manufacturer's serial number and signed declaration that it conforms to the flight test regulations, dimensions and documentation requirements set out in this document is a CIVL Certified Competition Class Paraglider.
- §4.12 The 2016 revision of the CIVL Competition Class rule does not apply retrospectively. Existing CIVL Competition Class Certifications issued prior to 1 October 2016 remain valid.

### **4.4 Paragliders permitted in competitions**

- §4.13 To be permitted in FAI Category 1 paragliding cross-country competitions, a paraglider model must be in accordance with section 6 of this document, and must be available in multiple sizes including at least a model with maximum take-off weight of 95kg or lower, and a model with maximum take off weight of 125kg or greater.

### **4.5 Additional definitions**

#### **4.5.1 Main lines**

- §4.14 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.
- §4.15 Main lines are labelled A, B, C, etc. for each span-wise plane of main lines, with the front-most plane in direction of flight being A.
- §4.16 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.

#### **4.5.2 Main line count**

- §4.17 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.
- §4.18 A paraglider model's main line count is given by the maximum main line count across all its chord-wise rows of attachment points.

#### **4.5.3 Line group**

- §4.19 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 (§4.16), either directly or through furcation points.

#### **4.5.4 CIVL accredited testing laboratory**

- §4.20 A CIVL accredited testing laboratory (short "testing laboratory") is an independent testing laboratory qualified for testing paragliders which has 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 Competition Class compliance.

## 5 Requirements for CIVL Competition Class

### 5.1 General

- §5.1 In order to be certified as a CIVL Competition Class paraglider a model size test specimen of that exact model and size must comply with the following set of requirements in its entirety:
- Physical requirements (**Ошибка! Источник ссылки не найден.** to §5.9)
  - In-flight requirements (§5.10 to §5.11)
  - Documentation requirements (§5.12 to §5.15)
- §5.2 Compliance with the requirements must be verified and certified by a CIVL accredited testing laboratory (§4.20), using the dimensions, measurement and testing procedures described in sections 7, 8, 9 and 10 of this document.
- §5.3 Scaling and manufacturer self-certification: IF a paraglider model of maximum take off weight 95kg or less has been certified in accordance with sections 5.1 and 5.2 THEN other sizes of that paraglider model derived by linear scaling are also CIVL Certified Competition Class paragliders. For these scaled model sizes the linear scaling factor must be defined by the manufacturer, and the wing dimension specifications must conform to that scaling factor with zero tolerance in all features except the lines. The lines for the scaled sizes must comply with the 23G theoretical load test (section 8.3) and the line lengths must correspond to the scaled dimensions with tolerance of +20mm, -20mm on the total length of each linked line measured from riser to sail.

### 5.2 Physical requirements

#### 5.2.1 Structural strength

- §5.4 All CCC wings must be constructed in compliance with the 23G theoretical load test requirements. In addition, where a manufacturer proposes to use structures or materials or construction methods that are novel and have not been through a physical load test in one of their previous glider models, the structural strength of a test specimen must be tested through a shock load test (8.2.3) and through a sustained load test (8.2.4).
- §5.5 Any existing EN certification for the test specimen implicitly satisfies the structural strength requirement (**Ошибка! Источник ссылки не найден.**) for the test specimen's model size.

#### 5.2.2 Line breaking strength

- §5.6 The test specimen passed the 23G theoretical line breaking strength test specified in section 8.3.

#### 5.2.3 Riser set layout

- §5.7 The test specimen's accelerator system, when fully engaged, shortens the front-most riser by 140mm or less in relation to the rear-most riser (tolerance 5mm), and the riser set is designed including physical limiter(s) to prevent any further shortening of the front-most riser relative to the rear-most riser by pilot action (such as application of excessive force).
- §5.8 The riser set must be clearly marked to show the accelerator position where the 100-105mm certification limiter is tight, and where the high-speed flight tests were performed.
- §5.9 The only technical means to alter airspeed in flight are the test specimen'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.

### **5.3 In-flight requirements**

- §5.10 The test specimen passed the flight tests specified in section 9.
- §5.11 Any existing EN 926-2 certification for the test specimen implicitly satisfies the flight test requirement (§5.10) for the test specimen.

### **5.4 Documentation requirements**

- §5.12 Certification documentation for the test specimen is complete according to section 10.
- §5.13 The test specimen's line lengths correspond with the lengths documented in the test specimen's user's manual, with a tolerance of +/- 10 mm.
- §5.14 The test specimen's riser lengths, both at trim speed and when fully accelerated, correspond with the lengths documented in the test specimen's user's manual, with a tolerance of +/- 5 mm.
- §5.15 The maximum shortening of the front-most risers relative to the rear-most riser through the accelerator is 140mm (tolerance 5mm).
- §5.16 For certification high speed test flights the risers are fitted with a limiter that fixes the maximum shortening of the front-most risers relative to the rear-most riser to between 100mm and 105mm.

### **5.5 Certification**

- §5.17 The testing laboratory, after verifying compliance with all requirements, issues a certification of compliance to the manufacturer, and submits a copy of this certification in electronic form to the CIVL competition coordinator at [civil\\_comps@fai.org](mailto:civil_comps@fai.org).
- §5.18 The testing laboratory provides CIVL with access to the complete test documentation files in electronic form.
- §5.19
- §5.20 The official certification date is the date when the full certification documentation is received by CIVL.

### **5.6 Marking**

- §5.21 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:
- Manufacturer's name
  - Paraglider model name
  - Paraglider model size indication
  - "CIVL Competition Class", edition of this document (i.e. "2016") and this document's issue date
  - Harness chest strap dimensions (distance between centre of base of connectors) used during flight tests
  - Year (four digits) and month of manufacture
  - Serial number
  - Recommended minimum total weight in flight (kg)
  - Permitted maximum total weight in flight (top weight)(kg)
  - Paraglider weight (canopy, lines and risers)(kg)
  - Projected area (m<sup>2</sup>)
  - Number of risers
  - Inspection periodicity: Number of hours / number of months ("whichever occurs earlier")

## **6 Permitted paragliders in FAI Category 1 competitions**

§6.1 Any EN-certified paraglider is permitted

- §6.2 Any CIVL Competition Class certified paraglider is permitted if all the following apply:
- a. The maximum take off weight 95kg or lower model of the glider certification has been completed and all flight test videos, dimensions, measurement specifications and documentations have been made available at the independent test house at least 90 days before the start of the FAI Category 1 competition.
  - b. The measurement specifications and documentation for the other sizes (including at least one where the maximum take off weight is 125kg or greater) of the paraglider model produced by linear scaling from the S have been made available at CIVL at least 60 days before the start of the FAI Category 1 competition
  - c. The gliders have been made available to the pilots at least 30 days before the start of the FAI Category 1 event.

## 7 Measurement definition for certification

### 7.1 Line length measurements

**Results:** Overall suspension line length, as defined by EN 926-2, Annex A, for all attachment points on the canopy. These measurements are required for the main suspension lines only. Brake line measurements are not required and brake lines may be re-trimmed.

**Unit:** Millimeter

**Tolerance:** +/- 10 mm

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

### 7.2 Riserset measurements

#### 7.2.1 Trim speed riser measurement

**Results:**

- 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 1 and Figure 2.
- The difference  $\Delta_i$  in riser lengths between front-most and rear-most riser.
- Photographic documentation of the riser set in trim configuration

**Unit:** Millimeter

**Tolerance:** +/- 5 mm

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

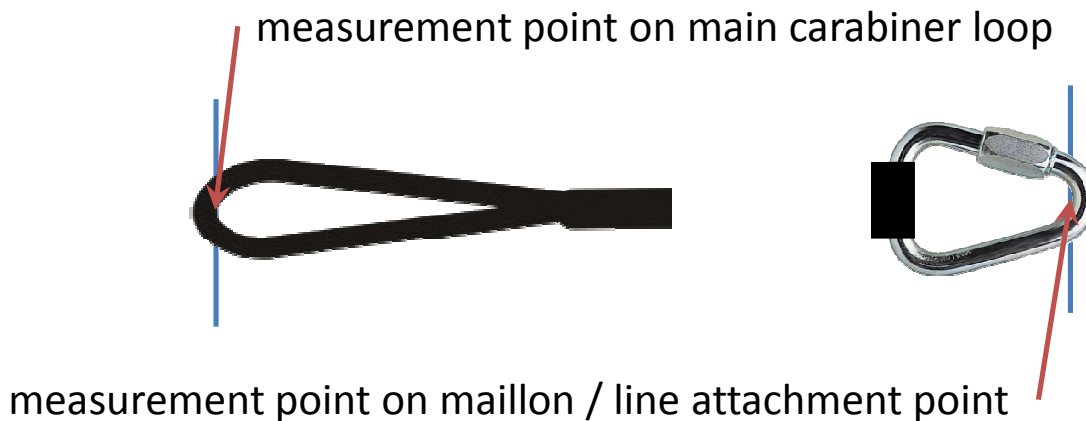
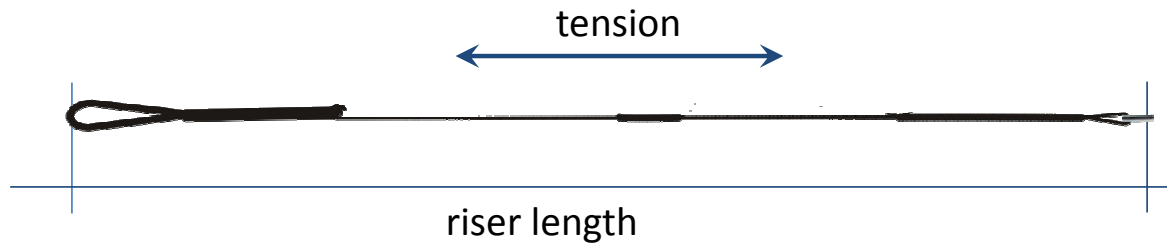


Figure 1: Riser measurement points



**Figure 2: 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 front-most ( $l_f$ ) and rear-most ( $l_r$ ) riser:  $\Delta_l = l_r - l_f$ .

### 7.2.2 Fully accelerated riser measurement

**Results:**

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

**Unit:** Millimeter

**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  $\Delta_a$  between the front-most and the rear-most maillon or line attachment point. See

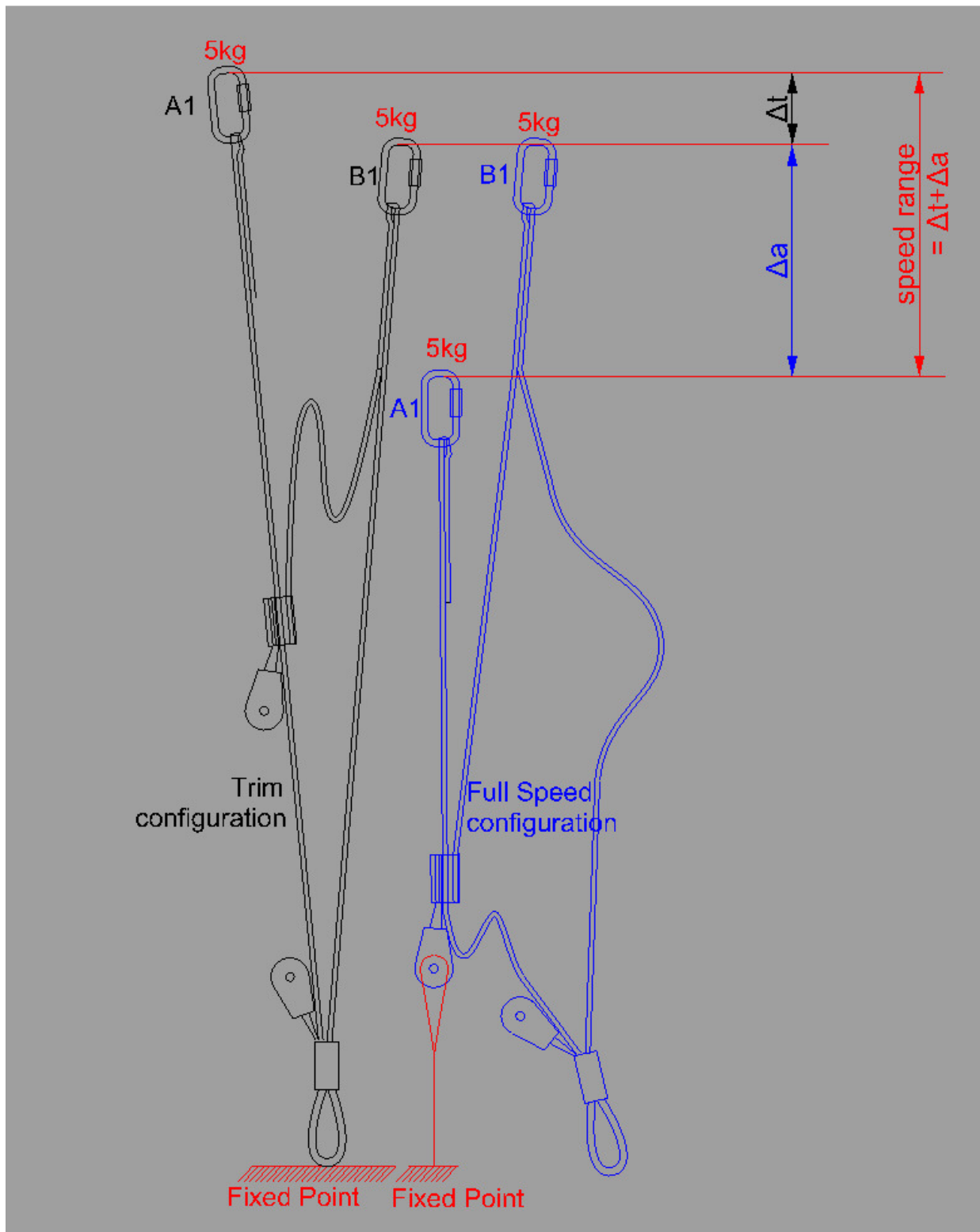


Figure 3 on the right, in this example,  $\Delta_a$  = distance between B and A1. For this example the B-limiter strap controls the riser travel, an A2 limiter line is not required.

4. Calculate the shortening of the front-most riser in relation to the rearmost riser as follows:  
shortening =  $\Delta_t + \Delta_a$



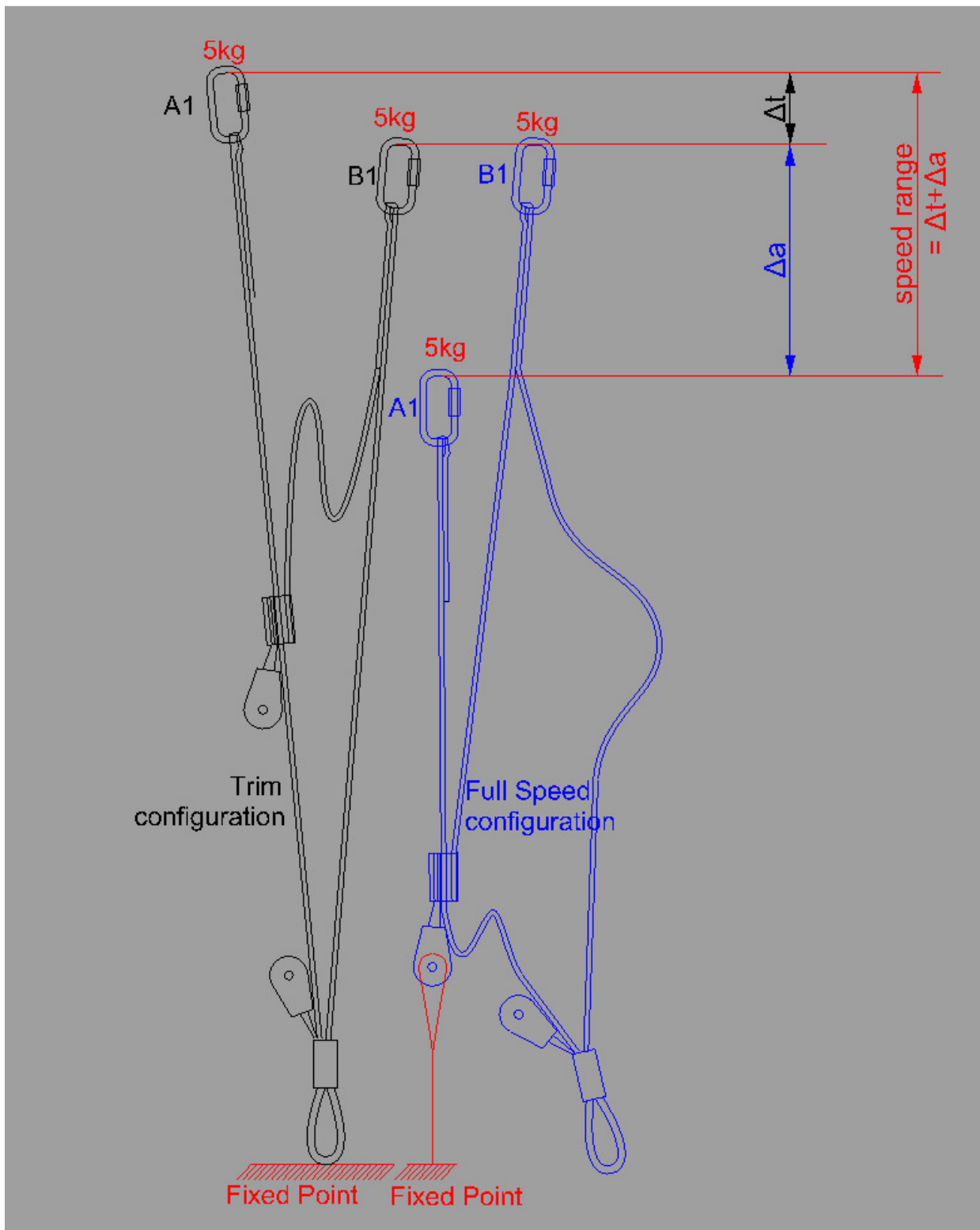


Figure 3: Fully accelerated riser measurement

## 8 Stability test definition for certification<sup>1</sup>

### 8.1 Terms and definitions

In the context of this section, the following terms and definitions apply in addition to the general definitions in section 4.

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

### 8.2 Structural strength tests

All CCC wings must be constructed in compliance with the 23G theoretical load test requirements. In addition, where a manufacturer proposes to use structures or materials or construction methods that are novel and have not been through a physical load test in one of their previous glider models, the structural strength of a single test specimen must be tested through a shock load test (8.2.3) and through a sustained load test (8.2.4). 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”

#### 8.2.1 Equipment

##### 8.2.1.1 Weak link

The weak link used in the shock load test must be calibrated for failure at a load of at least 6.67 times the test specimen’s top weight. The load is in N (i.e. 6.67 times max weight in kg times 9.81m/s/s acceleration due to gravity).

##### 8.2.1.2 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.

##### 8.2.1.3 Measurement circuit

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

##### 8.2.1.4 Video recording equipment

The video equipment used to document structural strength tests must be mounted on the test vehicle.

#### 8.2.2 Test specimen

The test specimen must be presented ready to fly and conforming in all points to the production model, including production-grade lines (without loops or knots), production-grade riser sets and a user's manual in a language acceptable to the testing laboratory.

#### 8.2.3 Shock load test

##### 8.2.3.1 Principle

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

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<sup>1</sup> This section is based on the EN standard definition EN 926-1.

### 8.2.3.2 Procedure

1. Connect the risers and the control handles to the same point at the weak link specified in 8.2.1.1.
2. Connect one end of the cable specified in **Ошибка! Источник ссылки не найден.** 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 test 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 wind speed in the immediate vicinity of the glider must be less than 2 m/s.
8. 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.
9. Continue until either of the following applies:
  - a. the weak link breaks
  - b. the test specimen fails

### 8.2.3.3 Result

The test specimen fails the shock load test if any damage, such as incipient tears, ruptured suspension lines or deformations, becomes apparent after the test.

## 8.2.4 Sustained load test

### 8.2.4.1 Principle

The test specimen is attached to a test vehicle and 'flown' whilst loads are measured. After completion of the sustained loading test, the wing is visually inspected for damage such as incipient tears, ruptured suspension lines or deformations.

### 8.2.4.2 Procedure

1. Attach the test specimen's riser sets, 0.42 m apart, to the electronic sensors on the tow vehicle.
2. Position a controller on the tow vehicle, to operate the test specimen's control lines to stabilise the wing.
3. Record the test on video from the tow vehicle so as to show the test specimen's behaviour under load.
4. 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.
5. When the 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 3 s.
  - b. Five peaks separated by at least 0.3 s are obtained above ten times the maximum tested weight, as defined by the manufacturer, in one run.
6. Record the attained maximum tested weight.

### 8.2.4.3 Results

1. The test specimen fails the shock load test if any damage, such as incipient tears, ruptured suspension lines or deformations, becomes apparent after the test.

- 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 shock load test if this value is less than the test specimen model size's top weight as specified in the user's manual.

### 8.3 *Line breaking strength test*

#### 8.3.1 Principle

The test specimen's top weight is compared with the theoretical breaking strength of the test specimen'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 test specimen, 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 glider, at the maximum flying weight of that glider size.

#### 8.3.2 Procedure

If identically constructed lines have already been tested and their breaking strength is known, then these previously established values may be used.

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. The speed of applying the load must be slower than 0.01666 m/s. 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.

Calculate the test specimen's theoretical maximum take off weight ( $W_{max}$ , in kg) as follows:

For the lowest line section (the one attached to the risers)

$$W_{max} = \frac{\sum_i F_{break_i} \times n_i}{23g}$$

Where

$$g = 9.81m/s^2$$

$F_{break_i}$  is the breaking force of line type  $i$  used in the lowest line section

$n_i$  is the number of lines of line type  $i$  used in the lowest line section

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

- At each level above, in every cascade of lines and across each line junction the calculated total strength has to be the same or stronger than the level below it (tolerance 5%). For example across a line junction where one lower line (e.g. 100daN) splits to two upper lines

the total strength of the two upper lines added together must be greater than the strength of the single lower line (i.e. >95daN total, given the 5% tolerance).

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,  $F_{\text{break}}$ , of any individual line, including the brake lines, must be equal to or greater than 20daN (new).

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

The main brake line must have a minimum strength of 100daN (new).

## 9 Flight test definition for certification<sup>2</sup>

### 9.1 Terms and definitions

In the context of this section, the following terms and definitions apply in addition to the general definitions in section 4.

**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 100mm (with +5mm tolerance – i.e. designed to limit maximum A-B travel to between 100mm and 105mm).

**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.

**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.

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<sup>2</sup> This section is based on the EN standard definition EN 926-2.

## **9.2 *Equipment***

### **9.2.1 Pilot equipment**

The pilot performing the manoeuvres must be equipped with:

- Helmet in accordance with EN 966;
- Radio communication system for announcing manoeuvres and comments in flight;
- Airspeed indicator;
- Variometer with adjustable acoustic sink alarms;
- Lifejacket (if the flight tests are carried out over water);
- system for adjusting the load in accordance with the manufacturer's requirements;
- Additional video cameras in the case of a manufacturer pilot performing manoeuvres;
- Emergency parachute which complies with EN 12491.

### **9.2.2 Ground equipment**

The ground personnel must be equipped with:

- Video camera to review the movements and actions of the pilot and the behaviour of the test specimen;
- Radio link with the test pilot to record his comments directly on the video tape.

## **9.3 *Test specimen***

The test specimen must be presented ready to fly and conforming in all points to the production model, including production-grade lines (without loops or knots), production-grade riser sets (ie risers matching the geometry that will be used in production, but with the 10cm certification limiter) and a user's manual in a language acceptable to the testing laboratory.

### **9.3.1 Marking**

#### **9.3.1.1 Canopy**

The test specimen's canopy, on its intrados side, must be clearly marked in the following way on the wing halve specified by the testing laboratory (see Figure 4):

1. A line must be marked from a point at 50 % of the trailing edge at a 45° angle to the leading edge.
2. Either side of this line, at distances of  $\pm 2.5$  % of the wingspan (with a minimum of 50 cm and maximum of 75 cm measured between the inside of the parallel marks) parallel marks must be attached, indicating the tolerance area.
3. A line must be marked from a point of 50 % of the leading edge at a 45° angle to the trailing edge.
4. A line must be marked on the top surface at a point 30% of the chord back from the leading edge.

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

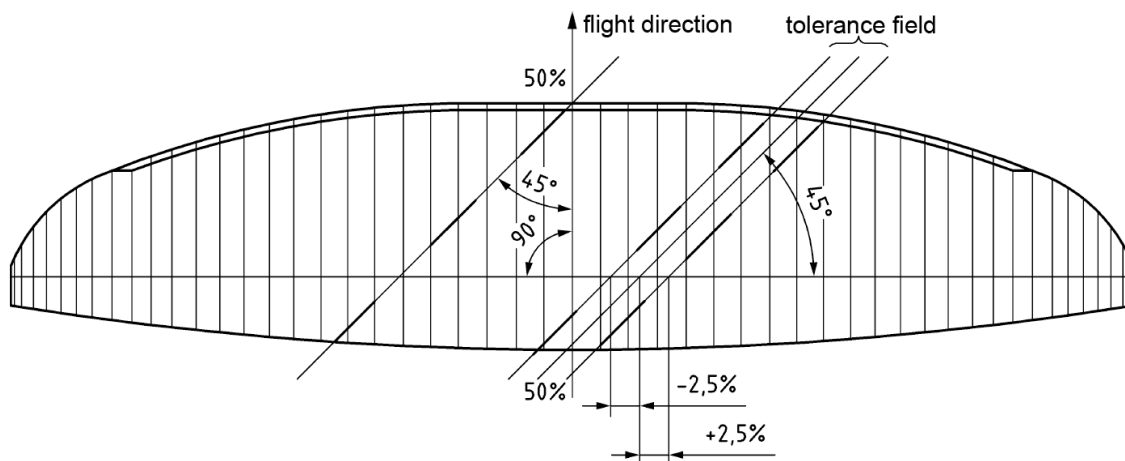


Figure 4: Canopy markings Control lines

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. When releasing the controls again, he lets go of the toggles (refer to the procedure in 9.5.2).

### 9.3.1.2 Streamer

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

### 9.3.2 Folding lines

If due to the geometry of a paraglider's suspension line system any type of deliberate folding as defined in 9.5 cannot be achieved in accordance with the procedure description, the manufacturer is required to attach additional lines, so-called folding lines, to the 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.

#### 9.3.2.1 Symmetric folding lines

Symmetric folding lines are used for achieving collapses as specified in 9.5 on paragliders where the standard technique of inducing collapses through the regular A risers results in pre-acceleration or pre-rotation to the point where the resulting collapses are no longer in accordance with the test specification. Symmetric folding lines can be used for symmetric and asymmetric collapse tests only: 9.5.5, 9.5.6, 9.5.10, 9.5.11, 9.5.12, 9.5.13 and 9.5.14. They must fulfil the following requirements:



1. For each side: One riser, a number of bottom lines attached to the riser, a number of mid-level lines attached to the bottom lines, a number of top lines attached to the mid-level lines and to the canopy.
2. The folding lines riser is no more than 1 m longer than the A riser.
3. The number of bottom folding lines attached to the folding line riser is identical to the number of main lines attached to the A riser.
4. The linked length of folding lines riser plus bottom folding lines must match the corresponding linked length of the A lines and riser, with a tolerance of + 1 m /-0 m at 5 daN tension.
5. The number of mid-level folding lines must be identical to the number of mid-level A lines.
6. The linked length of the folding lines riser plus bottom folding lines plus mid-level folding lines must match the corresponding linked length of the A lines and riser, with a tolerance of + 1 m / -0 m at 5 daN tension.
7. There must be no more than 15 top folding lines.
8. The linked length of the folding lines riser plus bottom folding lines plus mid-level folding lines plus top-level folding lines must match the corresponding linked length of the A lines and riser, with a tolerance of + 1 m / -0 m at 5 daN tension.

### **9.3.2.2 Asymmetric folding lines (also known as “cross line”)**

Asymmetric folding lines can be used for the large asymmetric collapse tests only: 9.5.12 and 9.5.13. They must fulfil the following requirements:

1. The setup consists of a riser, one bottom line attached to the riser, and up to three top lines attached to the bottom line and the canopy on the opposite side from the riser.
2. The minimum length of the bottom asymmetric folding line is the combined length of bottom and mid-level symmetric folding lines that lead to the same folding line attachment points.

### **9.3.2.3 Folding line attachment points**

Attachment points for folding lines must fulfil the following requirements:

1. All folding lines must be attached on the bottom surface of the canopy profile.
2. The minimum distance between leading edge and folding line attachment point must be 1% of the corresponding chord.
3. Folding lines must not be attached further backward than the corresponding top A lines.

## **9.4 Procedure**

### **9.4.1 General**

1. The test specimen's behaviour in the programme of test manoeuvres defined in 9.5 is demonstrated by a manufacturer pilot in front of a test pilot of the testing 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 9.5 at the maximum weight in flight declared by the manufacturer. The tests are executed by the testing laboratory's test pilot. Where indicated in the test description, the manoeuvre can be executed by a manufacturer pilot (see also 9.4.3).
4. In cases where the maximum take off weight 95kg or less size of the paraglider model has been tested by an independent accredited test organisation and has CIVL Competition Class Certification, other sizes of the test specimen may be produced by linear scaling from that wing. For those scaled gliders the flight tests may 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 9.5, the manoeuvre must be repeated. This may be due to an error of the test pilot or due to meteorological influences.
6. The test specimen fails the flight test if either of the following applies:
  - a. As a consequence of any of the tests manoeuvres described in 9.5, any failure of any part or component of the test specimen occurs
  - b. Any of the test manoeuvres described in 9.5 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.

### 9.4.2 Meteorological conditions

The following meteorological conditions must be met during the tests:

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

### 9.4.3 Tests executed by manufacturer pilot

For tests executed by a manufacturer pilot at an accredited independent test organisation, the following additional requirements apply:

1. The tests are performed under direct observation of a test pilot from the testing laboratory.
2. In addition to the usual video recording equipment used to document the tests, the manufacturer pilot is equipped with one or more on-board video cameras to record control movements and accelerator use.
3. 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.
4. For the test flights of the wings produced by linear scaling from the 95kg or lower maximum take off weight wing, 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 through direct observation as well as inspection of all recorded video evidence.

### 9.4.4 In-flight weight

1. The maximum in-flight weight declared by the manufacturer must not exceed the maximum weight in flight as determined by the test specimen's structural (section 5.2.1) and line breaking (section 5.2.2) strength tests.
2. The test weight in flight must be achieved using a single pilot.
3. All weights are subject to an acceptable tolerance of  $\pm 2$  kg.
4. All speeds are subject to an acceptable tolerance of  $\pm 2$  km/h.

### 9.4.5 Video documentation

1. All the tests must be filmed on video. If required explicitly by the procedures 9.5, the test pilot maintains a defined course relative to the camera axis when starting the test manoeuvre.
2. In 9.5 the following terms are used:
  - a. Camera axis: Profile: The pilot maintains a course at a right angle to the horizontal projection of the camera axis.
  - b. Camera axis: Face-on: The pilot is approaching the camera along the horizontal projection of the camera axis.

3. If manoeuvres are executed by a manufacturer pilot, the manufacturer test pilot is equipped with one or more on-board video cameras to record control movements and accelerator use.

#### **9.4.6 Radio documentation**

Any comments of the pilot in flight must be recorded on the video. Using the radio connection to the camera, the test pilot must:

1. Announce which manoeuvre is about to follow;
2. Add any comment helping to evaluate the glider's behaviour (optional);
3. Announce if he is sure any manoeuvre just performed was not valid for some reason.

#### **9.4.7 Harness**

1. The test pilot must use a harness with a distance of between 41 and 43 cm from the riser attachment points (measured from connector centrelines) perpendicular to the seat board top surface.
2. The horizontal distance of the harness' riser attachment points (measured from connector centrelines) must be set to 42 cm.
3. In the case of a pilot's weight of less than 50 kg the horizontal dimension is reduced to 38 cm.
4. In the case of a pilot's weight of more than 80 kg the horizontal dimension is increased to 46 cm.

#### **9.4.8 Ballast**

1. 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.
2. The use of water ballast is recommended for safety reasons.

#### **9.4.9 Pilot position**

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

#### **9.4.10 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, command extensions can be used for the sake of safety.

#### **9.4.11 Wraps**

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

#### **9.4.12 Timing when starting test measurements**

In tests 9.5.7, 9.5.8, 9.5.10, 9.5.11, 9.5.12 and 9.5.13, timing starts from the instant that the controls reach the zero position after the pilot releases them.

#### **9.4.13 Timing when exiting stalled flight conditions**

The glider is considered to have exited tests 9.5.7 and 9.5.8 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.

#### **9.4.14 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.

### 9.4.15 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.

### 9.4.16 Twist

In tests 9.5.10, 9.5.11, 9.5.12 and 9.5.13, 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.

### 9.4.17 Collapse on the opposite side

In tests 9.5.10, 9.5.11, 9.5.12 and 9.5.13, 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 considered a cascade.

## 9.5 Test manoeuvres

### 9.5.1 Speeds in straight flight test

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Assess the trim speed in 10 s stabilized straight flight.
2. Assess the minimum speed in 10 s stabilized straight flight.
3. Assess the riser configuration during stabilized straight accelerated flight with the certification limiter tight.

**Camera axis:** Camera not required

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

- a. The measured trim speed is less than 30km/h
- b. The speed range using the controls is less than 10 km/h
- c. The elements on the riser set designed to limit the top speed are not fully loaded and tight when the test specimen is fully accelerated
- d. The A-B distance is between 100mm and 105mm with the accelerator activated so that the certification limiter tight.

### 9.5.2 Control movement test

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Check the zero position and the symmetric stall position reference marks.
2. Stabilize the test specimen in straight flight at trim speed.
3. Over a period of 5 s 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.
5. Assess the control forces throughout the procedure.

**Camera axis:** Camera not required

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

- a. There is less than 5 cm of free control line travel before the zero position reference mark is reached.
- b. Symmetric control pressure is increasing, symmetric control travel is less than 35cm

- c. Symmetric control pressure is approximately constant and symmetric control travel is less than 40cm for a total weight in flight up to 80kg
- d. Symmetric control pressure is approximately constant and symmetric control travel is less than 45cm for a total weight in flight between 80kg and 100kg
- e. Symmetric control pressure is approximately constant and symmetric control travel is less than 50cm for a total weight in flight greater than 100kg
- f. Symmetric control pressure is decreasing

### **9.5.3 Pitch stability exiting accelerated flight test**

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Stabilise the test specimen in straight flight at highspeed with the certification speed limiter tight
2. Abruptly release the accelerator and assess the behaviour.

**Camera axis:** Profile

**Results:**The test fails if the resulting dive forward is more than 60°

### **9.5.4 Pitch stability operating controls during accelerated flight test**

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Stabilise the test specimen in straight flight at highspeed 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.

**Camera axis:** Any axis

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

### **9.5.5 Symmetric front collapse test at trim speed**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**Procedure:**

1. Stabilise the glider in straight flight at trim speed.
2. Release the controls and attach them to the risers (however, for safety reasons, the controls may be kept in the hands if the front collapse is achievable without significantly affecting the trailing edge).
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 or after 180° of turn (whichever happens first), act on the controls to recover (without inducing a deliberate stall).

**Camera axis:** Profile

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

- a. Recovery through pilot action does not occur within the first 3 s of pilot action
- b. During recovery, the test specimen dives forward more than 60° while entering a turn of more than 90°
- c. During recovery, the test specimen dives forward more than 90°

### 9.5.6 Symmetric front collapse test at highspeed

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**Procedure:**

1. Stabilise the glider in straight flight at high speed with the certification limiter tight.
2. Release the controls and attach them to the risers (however, for safety reasons, the controls may be kept in the hands if the front collapse is achievable without significantly affecting the trailing edge, and brake extensions may be used for safety).
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 or after 180° of turn (whichever happens first), act on the controls to recover (without inducing a deliberate stall).

**Camera axis:** Profile

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

- a. Recovery through pilot action does not occur within the first 3 s of pilot action
- b. After exit, the test specimen dives forward more than 60° while entering a turn of more than 90°
- c. After exit, the test specimen dives forward more than 90°

### 9.5.7 Exiting deep stall (parachutal stall) test

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**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 3 s.
3. Release the controls smoothly and gradually (in about 2 s) to the zero position.
4. If the glider has not recovered spontaneously in 5 s, act on the controls to recover, in accordance with the user's manual.

**Camera axis:** Profile

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

- a. Recovery does not occur within 5s without pilot action
- b. The dive forward on exit is greater than 90°
- c. A cascade occurs

### 9.5.8 High angle of attack recovery test

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**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 Brisers).
2. Maintain this high condition for 3 s.
3. Then release the risers slowly, symmetrically and continuously.
4. If the glider has not recovered spontaneously in 3 s, act on the controls to recover, in accordance with the user's manual.

**Camera axis:** Profile

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

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

### **9.5.9 Recovery from a developed full stall test**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**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.

**Camera axis:** Profile

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

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

### **9.5.10 Small asymmetric collapse test at trim speed**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**Procedure:**

1. Stabilize 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 50 % of the span along the marked line.
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 changes course by more than 360°, or 3 s elapse.
6. If the glider has not recovered, act to recover the glider.

**Camera axis:** Face-on

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

- a. Change of course until re-inflation is more than 180°, with dive or roll angle greater than 90°
- b. Re-inflation through pilot action does not occur within the first 3 s of pilot action
- c. A twist occurs
- d. A cascade occurs

### **9.5.11 Small asymmetric collapse test at high speed**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**Procedure:**

1. Stabilise the glider in straight flight at high speed with the certification limiter tight.
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 50 % of the span along the marked line.
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 changes course by more than 360°, or 3 s elapse.
6. If the glider has not recovered, act to recover the glider.

**Camera axis:** Face-on

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

- a. Change of course until re-inflation is more than 180°, with dive or roll angle greater than 90°
- b. Re-inflation through pilot action does not occur within the first 3 s of pilot action
- c. A twist occurs
- d. A cascade occurs

### **9.5.12 Large asymmetric collapse test at trim speed**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**Procedure:**

1. Stabilize 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 9.3.1.1. In the status of the maximum shape of the collapse, the bend line has to be completely (right through to the trailing edge) inside the marked tolerance field.
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 changes course by more than 360°, or 3 s elapses.
6. If the glider has not recovered, act to recover the glider.

**Camera axis:** Face-on

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

- a. Change of course until re-inflation is more than 180°, with dive or roll angle greater than 90°
- b. Re-inflation through pilot action does not occur within the first 3 s of pilot action
- c. A twist occurs
- d. A cascade occurs

### **9.5.13 Large asymmetric collapse test at high speed**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**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 they 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 9.3.1.1. In the status of the



maximum shape of the collapse, the bend line has to be completely (right through to the trailing edge) inside the marked tolerance field.

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 changes course by more than 360°, or 3 s elapses.
6. If the glider has not recovered, act to recover the glider.

**Camera axis:** Face-on

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

- a. Change of course until re-inflation is more than 180°, with dive or roll angle greater than 90°
- b. Re-inflation through pilot action does not occur within the first 3 s of pilot action
- c. A twist occurs
- d. A cascade occurs

#### **9.5.14 Directional control with a maintained asymmetric collapse test**

**Performed by:** Testing laboratory test pilot or manufacturer pilot

**Procedure A:**

1. Stabilize 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 50 % of the leading edge along the marked line and hold the collapse.
4. Attempt to keep 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.
6. Assess the position of the control relative to the symmetric stall position mark.

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

**Camera axis:** Face-on

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

- a. Unable to keep course
- b. 180° turn away from the collapsed side not possible in 10 s

#### **9.5.15 Trim speed spin tendency test**

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Stabilise the glider in straight flight at trim speed.
2. Over a period of 2 s activate one control to 25 % of the symmetric control range.
3. Wait 20 s or until the glider has turned 360°, then over a period of 2 s further activate the same control to 50 % of the remaining range, and wait 20 s or until the glider has turned another 360°, or the glider has obviously entered a spin.

**Camera axis:** Camera not required

**Results:** The test fails if a spin occurs.

#### **9.5.16 Behaviour exiting a fully developed spiral dive**

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Stabilize the glider in straight flight at trim speed.
2. Without weight-shift, apply a smooth progressive input with one brake until the glider enters a spiral dive. For a valid test, the glider should enter the spiral dive after a minimum of 5 s and a maximum of 1.5 turns without a spin or collapse occurring.
3. Hold the brake position reached while actively maintaining a central and neutral position relative to the risers (as if the harness was cross-braced).
4. Hold this position for 720°, then release the initiating brake smoothly and progressively in one turn.
5. While releasing the brake, no longer actively maintain a central and neutral position and allow the body to follow the inertial effects.

**Camera axis:** Any axis

**Results:** The test fails if the turn tightens after releasing the controls, as observed by increasing g force and turn rate.

### **9.5.17 Alternative means of directional control**

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Stabilise the glider in straight flight at trim speed.
2. Apply the alternative control method recommended in the user's manual without affecting the primary controls and perform a 180° turn.
3. Wait for 20 s or until the turn is completed.

**Camera axis:** Any axis

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

- a. No turn achievable in 20s
- b. Stall or spin occurs

### **9.5.18 Quick descent option in straight flight**

**Performed by:** Testing laboratory test pilot

**Procedure:**

1. Check whether at least one flight procedure for 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).

**Camera axis:** Camera not required

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

- a. No flight procedure for 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

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

**Performed by:** Testing laboratory test pilot

**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).

**Camera axis:** Camera not required

**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

## **9.6 Test report**

The test report must include the elements specified in 10.1.

## **10 Documentation requirements definition for certification<sup>3</sup>**

### ***10.1 Test report***

The test report must include:

1. A reference to this CIVL Competition Class Definition, i.e. CIVL CCC 2016, Revision 1
2. The name and address of the test specimen's manufacturer
3. The name and address of the person or company presenting the test specimen (if different from manufacturer)
4. Name and address of the testing laboratory in the case of the XS.
5. Names of the test pilots for the XS and for any of the other sizes produced by linear scaling
6. Model and reference of the test specimen
7. For models produced by linear scaling from the CCC S sized wing the scaling factor and linear dimensions of the wing produced by scaling, and of the line set after the permitted +2cm, -2cm retrimming compared to the scaled line dimensions.
8. Dimensions and results of the measurements programme according to section 7
9. Results of the load, strength and stability test programme according to section 8, including details of the tested reference structures and their certification results, and the 23G line load documentation, details and test calculations.
10. Results of the flight test programme according to section 9
11. Details of any damage after the test
12. Unique identifying test reference number

### ***10.2 Additional material***

The following items must accompany the test report and be filed by the testing laboratory, in the case of a glider certified at an independent accredited test laboratory, or by the manufacturer in the case of a manufacturer self-certified glider produced by scaling from the CIVL Certified Competition Class XS sized model:

1. All video recordings of the tests (archived for a minimum of 10 years)
2. Manufacturing record, as defined in 10.2.1 (archived for a minimum of 10 years)
3. The test specimen that has undergone flight testing (archived for a minimum of 5 years)

#### **10.2.1 Manufacturing record**

The manufacturing record supplied by the manufacturer must include the following information:

1. Name and address of the manufacturer
2. Designation of test specimen
  - a. Model name
  - b. Model size
  - c. Year and month of manufacture of the test specimen
  - d. Serial number
3. User's manual with date of issue and version number (as defined in 10.3)
4. Maximum total weight in flight (top weight)
5. Plans with dimensions and tolerances of:
  - a. Upper surface
  - b. Lower surface

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<sup>3</sup> This section is based on the EN standard definitions EN 926-1 and EN 926-2.

- c. Cell wells (ribs)
- d. Wing tips and stabilizers
- e. Rigging
- f. Method of assembly
6. Technical characteristics
  - a. Maximum wing span
  - b. Trailing edge length
  - c. Surface area calculated according to the following equation:  
(maximum wing span) x (mean chord), where chord = maximum length of cell walls (ribs)
  - d. Weight of paraglider (canopy, lines and risers, in kg)
7. List of components and materials. All the materials used must be listed with:
  - a. Name of the material
  - b. Manufacturer's and/or supplier's name and references
  - c. The material's specific use in the paraglider
  - d. Characteristics and tests carried out on this material by the supplier or manufacturer

**Note:**

1. The drawings and plans are provided in an annex to the manufacturing record. They permit the suspension lines, including any additional lines used for testing only, to be clearly seen and also give a plan view of all the components of the paraglider.
2. Drawings can be provided in electronic form, as long as their format is readable with standard office software.
3. In addition to any electronic form, suspension line and plan view drawings must be provided on paper.

### ***10.3 User's manual***

The user's manual should be supplied in English, additional languages are optional. It must always be distributed along with each specimen sold. Its contents must cover 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 mm)
  - f. Maximum symmetric rear riser travel at maximum weight in flight (in mm)
  - g. Introduction to the intended use of the paraglider
  - h. Description of the paraglider's flight characteristics, in comparison with a glider that is certified as EN D
  - i. 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 point positions
  - d. Projected area
  - e. Number of cells
  - f. Number of risers

- g. Dimensioned 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 100mm and 105mm for high speed flight tests) must be clearly specified. The length and configuration of the full-speed limiter (that limits maximum riser travel to 140mm, tolerance 5mm) 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. Dimensioned drawings 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 7.1.
  - j. Technical data on all suspension line materials: Manufacturer, manufacturer's code, diameter, core material, sleeve material, specified breaking strength, details showing the calculations demonstrating the glider conforms to the 23G theoretical load test of section 8.3
  - k. Harness dimensions used during flight testing
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 to apply
  - i. Any recommendations and special considerations regarding SIV. In particular:
    - i. If folding lines were used for the flight tests, including a set with each paraglider is recommended. Alternatively, the manual must give information on how to obtain a set of folding lines
    - ii. Instructions on how to correctly mount and unmount 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

**Note:** The user's manual can be provided in electronic form, provided the format is readable with standard office software.

## 11 Measurement definitions for verification in competitions

These measurement and testing procedures must be applied during competitions to verify that a particular paraglider corresponds with its Competition Class model size sufficiently to not give its pilot an unfair advantage over other pilots. Additionally, these measurements and testing procedures provide pilots with a simple way to verify their wing's conformity with certification themselves.

These measurements are intended to allow verification that the glider conforms to the design which was independently flight tested, or produced by scaling from the independently flight tested wing. Conformation to the certified type will typically be checked by the following standard measurements, but in the event of concerns regarding conformation further additional measurements may be made at the discretion of the meet director, for comparison with the detailed dimensions specified in the CCC documentation for the glider.

### 11.1 Line attachment point verification

A paraglider passes verification if visual comparison of all line attachment points on the paraglider's canopy with the photographic documentation of the line attachment points on the paraglider's CIVL Competition Class model and size shows no difference in design, construction nor materials used

### 11.2 Line length verification

As the starting point for all line length verifications, the actual overall line lengths are measured and recorded according to section 7.1. 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, as is standard practice for line measurements today. Brake lines are not measured.

#### 11.2.1 Relative line length verification 1: Angle of attack test

The purpose of this verification is to detect deliberate changes to the canopy's angle of attack with the intention of increasing the paraglider's performance. Additionally, this verification also allows pilots to verify whether their wing's line set complies with certification. Verification is done by executing the following test procedure:

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 +2cm/-2cm.
4. The glider fails if it is trimmed fast >-2cm. If the glider is trimmed slow >+10mm the pilot should be warned that the glider is out of trim and potentially unsafe.

#### 11.2.2 Relative line length verification 2: Camber test

This verification only applies to gliders with 3 or more lines chordwise. (see §4.18). The purpose of this verification is to detect deliberate changes to the canopy's camber (the arching of the profile in chord-wise direction) with the intention of increasing the paraglider's performance. The tests performed in 11.3.1 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/-2cm .

### **11.2.3 Absolute line length verification: Arc test**

The purpose of this verification is to detect deliberate changes to the canopy's span-wise arc with the intention of increasing the paraglider's performance. Verification is done by executing the following test procedure:

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 +5cm/-5cm.

### **11.3 Riser length verification**

A paraglider passes verification if riser set measurements according to section 7.2 yield results that correspond with the dimensions documented in the paraglider's manual, and by the testing house, with a tolerance of 5 mm.

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 140mm with tolerance 5mm.

### **11.4 Line diameters, profiles and internal structure verification**

A paraglider passes verification if:

1. all its line diameters are identical to the ones listed in the model size's stored schematics, as well as the ones present on the stored reference glider
2. To verify line diameters manufacturers must produce a reference card holding labelled samples of each of the line types used in the line set of each size of a paraglider model. Verification is confirmed by directly comparing the reference card lines with those on the wing being tested.



**Appendix A**