



# **Owners Manual The Rock<sup>2</sup>**

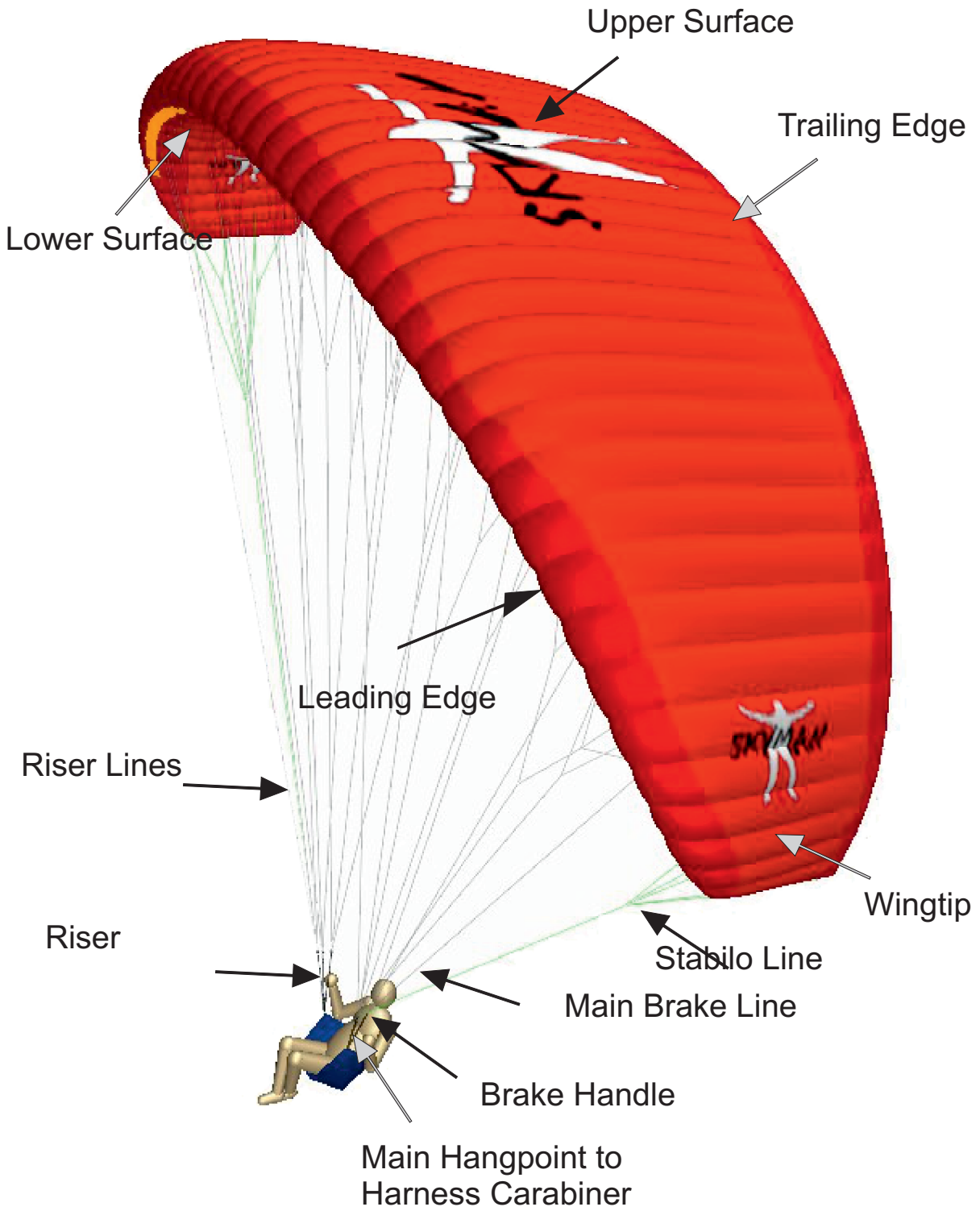
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**Technical Drawing:**





## 1. Dear Skyman Pilot

We are pleased to welcome you to the world of Skyman paragliders. The The Rock<sup>2</sup> was developed for those XC pilots who enjoy very good performance, high speed and high manoeuvrability and do not want to do without safety.

Like every paraglider, the The Rock<sup>2</sup> also has its own character and wants to be flown in its own way. In order to provide you with the greatest possible flying pleasure, we have compiled the following owner's manual.

## 2. Important Notes:

### **Reading this owner's manual is mandatory!**

The paraglider must not be put into use without careful study of this manual in order to avoid operating errors. We hereby explicitly point out that no liability can be accepted for possible consequences of improper handling.

This paraglider is a "light air sports glider with an empty mass of less than 120 kg" in the paragliding sector. At the time of delivery, it complies with the provisions of the German Airworthiness Requirement (LTF) and the European Standard EN 926-2, Category B in all sizes.

New gliders must be flown in by the seller. This flight has to be confirmed with date and signature on the attached measurement protocol and on the type label of the paraglider.

Any unauthorized modification to the paraglider will invalidate the operating license!

The pilot is responsible of the airworthiness of his glider! It is also the pilot's responsibility to ensure that all legal regulations necessary for the operation of this glider are met (e.g. pilot license, insurance, etc.).

It is presupposed that the abilities of the user correspond to the requirements of the device!

The use of the paraglider is at your own risk! The liability of the manufacturer or distributor is excluded!

The following owner's manual has been compiled to the best of our knowledge and belief. However, it is quite possible that different aspects may change in the course of time due to (flight) technical innovations or changed approval tests and/or teaching methods. Therefore it is advisable in any case to obtain "updates" in suitable form about possible changed opinions and tests either from us or from the appropriate authorities.

## 3. Target group:

The The Rock<sup>2</sup> is classified in category A according to LTF (German airworthiness requirements) and EN 926-2 at the same time. After both tests, the The Rock<sup>2</sup> is only certified as a single-seater. It is suitable for experienced and performance-oriented pilots.

Whether the The Rock<sup>2</sup> is finally suitable for the pilot's own flying purpose and ability should always be discussed personally with the dealer.

We recommend every pilot to do a safety training and to play as much as possible with his glider on the ground. Perfect control of the glider on the ground and in the air is the key to maximum flying fun and the best insurance for accident-free flying.



## **4. Technical Description:**

### **Canopy construction:**

The canopy of the The Rock<sup>2</sup> is made of nylon fabric by Dominico Tex Corp. and NCV Industries. This synthetically manufactured fabric is woven with a reinforcing mesh to prevent tearing and increase tensile strength at the seams. The coating makes the fabric water repellent, UV resistant and air impermeable.

The The Rock<sup>2</sup> consists of 61 cells. The wing tip (stabilizer) is pulled down and is integrated seamlessly into the canopy.

The canopy is ventilated through openings on the underside of the profile nose. Cross ventilation is provided by precisely dimensioned holes (cross ports) in the profile rib.

Each main profile rib is suspended from a line connection. They are reinforced in the profile.

Tensioning straps are sewn in between the groups of main lines to regulate the sail tension.

Reinforcements are sewn into the profile nose to ensure high shape retention and stability.

A low-stretch tape is sewn into the leading and trailing edges, which provides a sophisticated tension distribution across the canopy calculated by our construction software

### **Suspension System:**

The lines of the The Rock<sup>2</sup> consist of polyester-coated and uncoated aramid and polyester-coated PES / Dyneema, depending on the location. The strength of the individual lines varies from 65 to 280 daN depending on the location.

Depending on where the lines are installed, they are divided into upper lines (at the top of the canopy), middle lines, main lines (or riser lines), stabilizer lines (at the wing end) and brake lines (at the top of the trailing edge) and main brake lines (at the brake handle).

The lines are divided into A / B / C / D level and brake.

Within each level, 2 gallery lines are combined into one middle line. The 4 gallery lines of the D plane are integrated in the C middle lines. On the riser line level, 2 middle lines are grouped into a total of 6 riser lines per level and attached to the corresponding risers.

The stabiliser lines are attached to the B-riser.

The brake or steering lines are combined into the main brake line according to the same principle.

The lines of each level are colored differently for easier control.

The riser of the The Rock<sup>2</sup> has 3 risers on each side.

The A-riser is divided into a main (A)- and a secondary riser (A'). In the A-riser 2 main lines and A'-riser 1 main line are attached.

In the B-riser 3 B main lines plus 1 stabilizer line are connected on each side.

The C riser holds 3 C main lines on each side. The upper lines of the D-level are joined to the C-level.

The main brake line is guided to the brake handle via a pulley on the C-riser.

The line connectors are made of stainless steel and are secured with a plastic insert against unintentional opening and slipping of the lines.

There are no adjustable devices available.

The line arrangement is shown in the individual line plan.

### **Acceleration system:**

The The Rock<sup>2</sup> has a foot acceleration system that automatically returns to the original position after use. The riser does not have a lockable trimmer.

The acceleration system shortens the A and B risers and reduces the angle of attack of the canopy. In normal flight all risers have the same length (53 cm with link). The A-risers are shortened by up to 15 cm and the B-risers by up to 12.5 cm when the acceleration system is operated. The C-risers are not shortened.

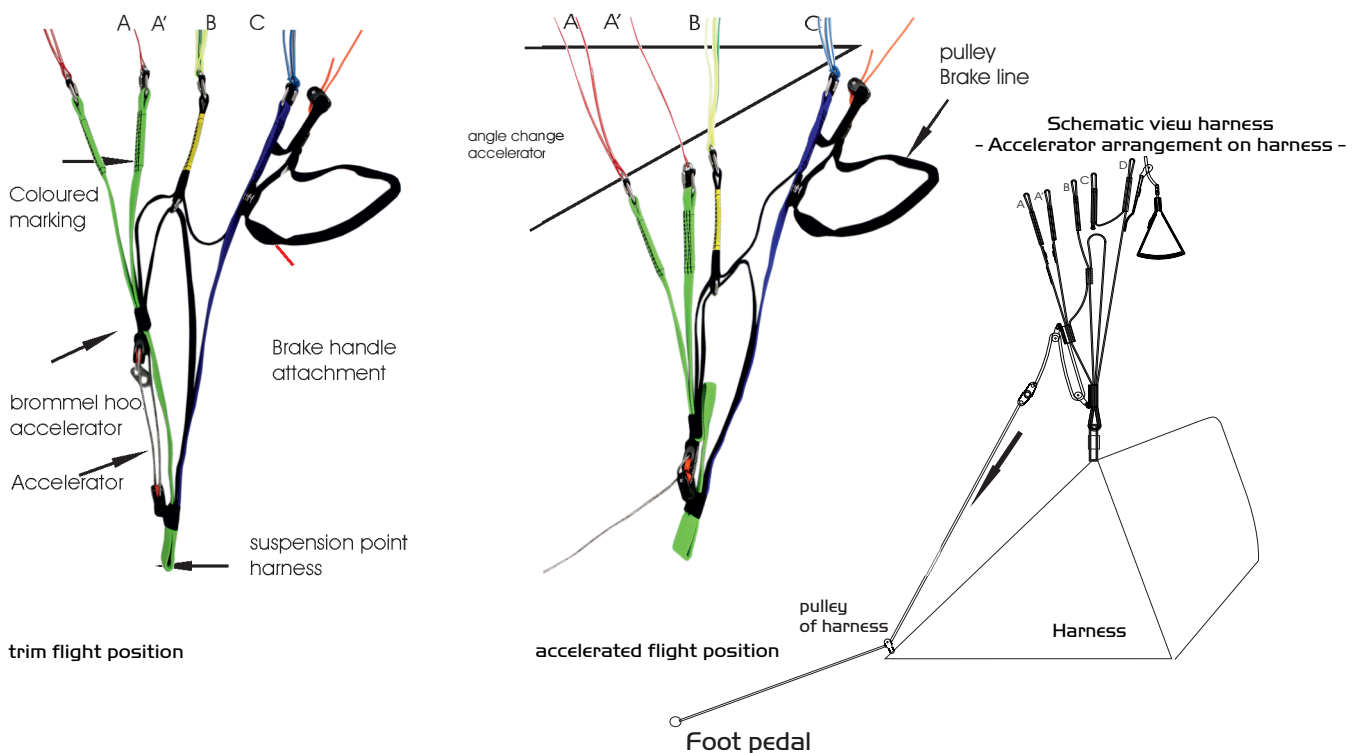


### Functionality and handling:

Before take-off, the brummel hooks are hooked into the brummel hook of the acceleration system of the harness's foot accelerator. Make sure that the suspended accelerator is running freely. The length of the foot accelerator must be set correctly before using it for the first time. This is done best in the simulator. The length is set correctly if the accelerator rope still has some slack and is not under tension when the accelerator is not in use.

By operating the foot accelerator the pilot shortens the A/B belts by a pulley system which reduces the force.

### Overview risers:



## 5. Technical Data:

size		L - 29,5M - 27,5	S - 25,5	XS - 23,5	XXS - 22	
Flat surface	m <sup>2</sup>	29,5	27,5	25,5	23,5	22
Flat span	m	11,77	11,36	10,94	10,50	10,16
Flat aspect ratio	A/R	4,69	4,69	4,69	4,69	4,69
Projected surface	m <sup>2</sup>	25,16	23,45	21,75	20,04	18,76
Projected span	m	9,31	8,99	8,66	8,31	8,05
Projected aspect ratio	A/R	3,45	3,45	3,45	3,45	3,45
No. of cells	Nr	40	40	40	40	40
Min Take off weight	Kg	105	85	75	60	50
Max Take off weight	Kg	130	110	95	85	70
V-Trim	Km/h	37	37	37	37	37
V-Max.	Km/h	48	48	48	48	48
LTF / EN Category		A	A	A	A	A

Changes of these data are possible!



## **6. Harness**

The The Rock<sup>2</sup> has been tested and approved in the weight range up to 80 kg with harnesses of the LTF type GH with 42 cm chest strap width and > 80 kg with 46 cm chest strap width. Almost all harnesses available on the market are "GH" harnesses and suitable for the The Rock<sup>2</sup>. These differ from GX harnesses by a lower suspension and not very effective (if any) cross straps.

## **7. Checking the paraglider:**

Every paraglider delivered is checked and measured several times by us before delivery. Nevertheless, we recommend that you check the new paraglider thoroughly according to the following points.

These instructions should also be followed if the paraglider has to be checked after intensive flight, hard manoeuvres or tree landings.

- The seams on the line suspension loops, on the risers and on the canopy must be checked for damage.
- Are all lines free of damage and correctly sewn?
- Are all line locks correctly screwed and the plastic inserts fastened?
- All the panels, including the ribs and V-tapes, must be inspected for cracks.

Any damage, however inconspicuous, must be inspected and repaired by an expert. A damaged paraglider is not airworthy!

## **8. Adjusting the steering lines:**

The two main steering lines lead to a multiple line branching, which are fixed at the trailing edge. At the risers the steering lines run through a guide pulley and each is connected with a handle. These control handles are attached to the risers with two snap fasteners during transport. The steering line length is set correctly at the manufacturer and normally does not have to be changed. The setting point is permanently marked on the main steering line with an additional sheath. It must have at least 5 cm freewheel in flight (before the brakes take hold) and should not be changed. The improper change of the steering line length changes the flight behaviour and impairs the safety of the glider.

## **9. Flight operation:**

The following pages are not intended to be a guide for paragliding. Rather, we want to introduce you to the special features of the The Rock<sup>2</sup> and give you some important information for flight and safety. Other special flight manoeuvres or configurations of the glider are not recommended.

### **9.1. Take-off preparations:**

A careful pre-flight check must be carried out before each take-off. The risers, lines and canopy must be checked for wear. It also must be ensured that the line links are tightly closed and secured against twisting with a plastic clip.

The harness must be put on with the greatest care. After putting on all buckles have to be checked again if they are closed correctly. The correct closure of the rescue system container and the correct fit of the rescue system handle must also be checked (see harness manual).

If a defect is found, do not take off under any circumstances!

The The Rock<sup>2</sup> can best be started if it is laid out in an arch. When laying out, the canopy must be laid out against the wind.

Separate the lines and brake lines carefully and sort the risers. All lines must be free and without entangling or knots. There must be no lines under the canopy.

Once all preparations have been completed, the main carabiners of the harness are connected to the risers. Make sure that the carabiners are closed. When using a foot accelerator, the two brummel hooks are also to be connected. Make sure that the acceleration system is free and untwisted.



## **Checklist:**

### **Paraglider:**

- Canopy without damage?
- Risers without damage
- Line links tightly closed?
- Lines without damage?
- all lines free and without entanglement and knots? Also brake lines?

### **Harness:**

- Rescue system container closed?
- Rescue system handle correctly attached?
- all buckles and main carabiners closed?

### **Take-off:**

- Risers not attached twisted?
- Speedsystem not attached twisted?
- Brake handle and correct riser taken up?
- Is the pilots position in the middle so that all lines are symmetrically tensioned?
- Is the wind direction okay?
- Obstacles on the ground?
- Air space free?

## **9.2. Take-off:**

The The Rock<sup>2</sup> is very easy to launch. In general we recommend to use both A-risers (A and A') at the take-off. Depending on take-off technique, wind conditions and terrain, you can use alternatively only the middle A-risers to pull up the paraglider.

For better orientation, the different riser levels are marked in colour and text.

The pilot, who is ready for take-off, holds the A-risers and brake handles in his hands on each side and pulls the A-lines slightly. If the take-off area is flat and there is little wind, you can alternatively take a step back towards the canopy and pull up the paraglider with more impulse. During the take-off run, the arms are first stretched sideways to the rear in line with the A-risers and are guided upwards as the paraglider rises.

As with all gliders, the most important thing when launching is not the force but the constancy of the tension. As the The Rock<sup>2</sup> is very easy to inflate, it needs to be braked on steep take-off areas or in strong winds to avoid overtaking the canopy.

When launching the glider backwards in strong wind, it is easy to prevent premature take-off by following the glider while it is being pulled up. The best preparation for perfect strong wind launches is still playing on the ground for hours in the wind.

## **9.3. Straight flight:**

The The Rock<sup>2</sup> has a trim speed of 37 to 39 km/h depending on the wing load with fully released steering lines. In calm air the The Rock<sup>2</sup> reaches the minimum flying speed (depending on the wing load) with about 55 to 60cm brake line pull. In turbulent air we recommend to fly with 5 to 15 cm pulled steering lines. The current angle of attack of the canopy is then higher and it is more difficult to undercut the air at the profile nose.

According to EN 926-2, the maximum symmetrical control travel is at least 55 cm for 80 kg take-off weight, at least 60 cm for 80 kg to 100 kg take-off weight and at least 65 cm for 100 kg take-off weight and above.

We understand all indicated cm values from the point where the trailing edge is pulled down, i.e. without the freewheel.



## **9.4. Accelerated flight:**

When the acceleration system is operated by the feet, the angle of attack of the canopy changes and the The Rock<sup>2</sup> flies up to 16 km/h faster. Due to the higher speed the glider is more unstable and collapses more easily.

For safety reasons you should only fly accelerated in calm air with sufficient distance to the ground. Never let go of the brake handles during accelerated flying!

When flying into turbulence, the acceleration system must be deactivated immediately!

Pulling the steering lines during accelerated flight should also be avoided, as the nose will nod even more downwards for a short time due to the increased air resistance at the trailing edge and the danger of "undercutting" will increase and the glider can collapse violently.

If the glider collapses, the acceleration system must be deactivated immediately, then the canopy is first stabilized by the steering lines and then reopened.

## **9.5. Turns:**

The high agility of the The Rock<sup>2</sup> is due to its special steering characteristics: It reacts very directly and without delay to control impulses.

By shifting the weight (the pilot leans on the inside of the curve), very flat curves can be flown with minimal loss of altitude.

Weight shifting and pulling on the inner steering line is suitable for fast changes of direction.

For thermal flying, the combination of weight shift, braking on the inside of the curve and controlled additional braking on the outside of the wing is best recommended. By pulling in the opposite direction and releasing (active flying) with the inner and outer brake, the curve radius and lateral position can be changed and the centering of the thermals can be optimised.

**Attention:** if the steering lines are pulled too far or too fast, there is a risk of stall!

A one-sided stall is clearly announced: the inner side of the wing curve becomes soft and the inner third of the wing almost "stops". If this flight condition has occurred, the inner brake must be released immediately.

## **9.6. Active flying:**

Active flying can prevent many collapses in advance!

Active flying means to fly the paraglider as stable and efficient as possible by shifting weight and steering impulses.

In turbulences and rough thermals the glider should always be held vertically above you by active flying with controlled brake inputs.

When flying into strong thermals, the angle of attack of the paraglider increases. If the brakes are released while flying into the thermals, the canopy can accelerate and remains almost above the pilot's head. The situation is different when flying into down winds: here the brakes are applied in a controlled manner.

## **9.7. Landing:**

The The Rock<sup>2</sup> is easy to land. In the final glide against the wind the wing can be let out slightly braked. At a height of approx. 1 m above ground, the angle of attack is raised and intercepted by an increased braking level. The time of landing should coincide with the full use of the brakes.

If there is a strong headwind, the use of the brakes should only be very controlled in order to avoid a stall before landing!

On this occasion we would like to suggest not to reduce the altitude by the risky bad habit of "pumping" if the approach is too high.

Also landings with steep curves or turns in the final approach are to be avoided absolutely.

After the landing the wing should not fall on the ground with the nose first. This can destroy the profiles and impair the material in the leading edge area on the long run!





## **10. Winch towing:**

The The Rock<sup>2</sup> is suitable for winch towing. We generally recommend using a towing aid for all paragliders, which activates the acceleration system during the towing process.

This towing aid accelerates the paraglider during the towing process and thus not only simplifies the take-off procedure but also reduces the risk of deep stall and enables higher release heights.

**Attention:** Paragliders which are damp and/or whose line lengths/air permeability values are no longer within the permitted tolerance have a significantly increased risk of deep stall when towing with a winch!

Winch towing is only permitted with a valid winch towing licence. The special features of a towing site and the equipment used (winch, towing release, etc.) should always be discussed with the winch operator and the take-off officer first.

We expressly point out that the equipment required for towing must also be certified in any case.

## **11. Powered flight:**

The The Rock<sup>2</sup> is currently not certified for flying with a paramotor.

## **12. Extreme flight situations:**

### **12.1. Side collapse:**

A side collapse is probably the most common malfunction in paragliding. If the The Rock<sup>2</sup> collapses in turbulent air, this usually only occurs in the outer wing area.

In order to maintain the flight direction in this flight condition, the opposite, open wing side has to be braked.

If the canopy collapses very hard, the braking of the open side may only be very dosed to avoid a stall.

After the turning away has been prevented by counter-steering, the canopy can be opened again at the same time by pumping on the folded side.

If the side collapse is not actively counteracted, the The Rock<sup>2</sup> usually opens automatically within less than half a turn. If the canopy does not open automatically due to the strong turbulence or other influences (entangled lines), the paraglider will turn into a spiral dive.

### **12.2. Entangled lines:**

In the event of large collapses or other extreme situations, any paraglider may become tangled. The collapsed sections of the wing tip will get caught in the lines. Without pilot reaction the glider turns into a very strong spiral.

Once this has happened, the turning of the wing must be stopped first by a sensible counter-brake.

If the rotation speed should continue to increase despite counter-action, the rescue parachute must be released immediately at low altitudes.

If the height is sufficient, the following possibilities can be used to try to release the entangled wing tip:

- Try a sensitive counter-braking and a very fast, resolute and deep pulling of the steering line at the entangled side.

- Pull the coloured Stabilo line.

If these measures are not successful, you can try to release the entangled wingtip with a full stall if the height is sufficient.

**Attention:**

The flight manoeuvres mentioned above are very demanding and can cause high altitude loss! If the pilot feels overstrained or if there is not enough altitude, the rescue system must be activated immediately!



### **12.3. Front stall:**

The collapse of the entire leading edge is usually caused by strong pulling on the A-belts, accelerated flying or sudden strong turbulence. Although this flight disorder looks spectacular, it is often not dangerous if the collapse depth is low. Often there are no turning movements, the glider usually opens quickly by itself and quickly picks up speed again. The opening can be accelerated by braking in a controlled manner on both sides.

Timely recognition of the situation and quick reaction by braking on both sides helps to keep the loss of altitude as low as possible and not to lose control of the malfunction.

### **12.4. Deep stall:**

During a deep stall, the paraglider has no forward speed and at the same time significantly increased sink rates. The deep stall is caused, among other things, by releasing the B-risers too slowly when the glider is in a B-stall, by an old and porous cloth, by damage to the lines or ribs, by pulling the C- or D-risers or by an inadmissible take-off weight. Even if the canopy is wet or the air temperature is very low, the tendency to stall increases.

Flying in the rain should be avoided as far as possible, as the raindrops on the canopy increase the  $V_{min}$  and thus the tendency to stall increases. Also very low temperatures can be problematic. In both cases, especially when the brakes are applied and/or the line geometry is no longer trimmed correctly.

If the glider is in a deep stall, you can recognize this by the fact that the noise is very low and the glider is in an unusual position above the pilot. In this case it is absolutely necessary to release the steering lines!

If the canopy and lines are in good condition, the The Rock<sup>2</sup> will automatically pick up speed again within 2 to 3 seconds. If, for whatever reason, this is not the case, the A-risers must be pushed forward or the acceleration system must be activated.

If a glider has been in a continuous stall for no apparent reason (e.g. wet glider, flight in rain or inadmissible take-off weight), it must be checked before the next flight.

Attention: The brakes must not be applied in deep stall flight, as the paraglider immediately enters the full stall. A stable stall may no longer be released near the ground due to a possible pendulum movement. Instead, the pilot prepares himself for a hard landing, if possible with a landing fall.

### **12.5. Full stall:**

To initiate a full stall, both brake lines must be pulled through completely. When the stall speed is reached, the canopy empties abruptly and suddenly tilts backwards.

It is very important, despite the unpleasant reaction of the glider in a full stall, to keep the steering lines pulled through until the empty glider comes back over the pilot (approx. 3 to 6 seconds) and stabilizes in this position.

Only now the steering lines are reasonably fast (switching time  $\geq 2$  sec) and symmetrically released. The optimal recovery should take place in 2 phases: 1. prefilling of the canopy (slow release of the brakes up to shoulder height) until the canopy is fully open again; 2. recovery (braking to 0%).

If the canopy is released too quickly or asymmetrically, the result may be a large collapse or front stall.

Attention: A wrong, too early, asymmetrical or too fast released full stall can result in an extremely wide forward movement of the canopy! In extreme cases under the pilot!

### **12.6. Spin:**

By stalling one side, the flow can break off at half of the wing. This reverses the direction of air flow. The trailing edge, which is deeply braked, is then streamed from the back and flies in the opposite direction and the canopy rotates around its vertical axis.

There are 2 causes for a spin:

- A brake line is pulled through too quickly and too far (example: initiating a spiral dive).
- in slow flight one side is braked too much (example: in thermal circling)

If an inadvertently initiated negative turn is immediately released, the glider returns to normal flight without great loss



of altitude. If the negative turn is held longer, the glider can accelerate and shoot forward on one side. This can result in an impulsive collapse or entanglement.

### **12.7. Wingover:**

Tight turns to the left and right are flown alternately. The cross slope is progressively increased. If the dynamics and lateral position of this flight manoeuvre is too high, the outer wing can relieve the load. If the lateral inclination is further increased and the reaction is wrong, the result may be an impulsive, large-scale collapse.

**Full stall, spin and wingover on all paragliders can have life-threatening consequences!!**

### **12.8. Emergency steering:**

If the steering lines fail, the "The Rock<sup>2</sup>" can easily be steered by using the rear risers. The distance to the stall is of course much shorter when steering with the rear risers than with the steering lines, it is about 10 - 15 cm with the "The Rock<sup>2</sup>". You can also fly light curves by pulling the Stabilo lines or by weight shifting.

## **13. Decent aids:**

### **13.1. Spiral dive:**

The spiral dive is the most efficient way to descend fast. However, high loads occur for material and pilot. It has to be taken into consideration that, depending on the daily shape, the outside temperature (cold!) and the sink rate, you may sooner or later lose consciousness. Many pilots slow down their breathing during the spiral or go over to press breathing, which increases the risk of losing control even more. At the first signs of dizziness, loss of consciousness and loss of vision, the spiral must be immediately stopped.

The spiral dive is initiated by carefully pulling the brake line on one side and shifting the weight to the inside of the curve. Due to the direct handling the The Rock<sup>2</sup> quickly takes a high lateral inclination and flies a steep turn. As soon as the wing comes in front of the pilot ( goes on the nose ) an impulse is generated, which the pilot should follow by shifting his weight to the outside of the curve.

The sink rate and inclination in the spiral dive are increased by a controlled pulling of the brake line inside the curve. Slight braking on the outside of the curve prevents the outer wingtip from collapsing.

To exit the spiral dive, the brake inside the curve is slowly released.

Rapid release of the brake means that the high airspeed (up to over 100 km/h) is translated in a strong pendulum movement into height. The result is an extreme deceleration at the end of the pendulum movement with subsequent tilting of the canopy. You also have to calculate that you will get into your own wake vortex (rotor)!

Due to the extreme loss of height in the spiral dive, it is always important to ensure sufficient safety height!

**Attention:** Almost every paraglider reaches a sink rate at which the canopy faces the openings downwards ("goes up on the nose!") and remains in this position despite releasing the steering lines and continues to spiral (stable spiral dive).

The The Rock<sup>2</sup> has been classified B according to EN 926-2:2013. Due to unfavourable influences, however, the reactions can also be more demanding than described in this classification. The causes in such a case can be complex. For example: harness geometry (suspension height), cross straps, turbulent air, holding on to the riser, shifting the pilot's weight to the inside of the curve and similar.

If, against all expectations, a stable spiral dive should occur, this is released by shifting the pilot's weight to the outside of the curve and counter-braking in a controlled manner.

**Attention:** in a stable spiral dive, extreme G loads can have an effect on the body and require a lot of physical strength!



## **13.2. Big Ears:**

The so called "big ears" manoeuvre is an easy, but not very effective descent method where the forward speed is higher than the descent speed. It is more suitable to reduce the glide angle and to gain horizontal distance from a source of danger than to descend fast.

To perform "big ears", the two wingtips are folded symmetrically downwards by pulling the outer A-risers (A').

The "big ears" can increase the descent speed to approx. 5 m/sec. and reduce the glide angle.

By using the foot accelerator the sink rate and the forward speed can be increased significantly.

It is sufficient to release the outer A-risers to exit this manoeuvre. The wing tips of the The Rock<sup>2</sup> usually opens automatically. The pilot can slightly brake to speed up the opening.

Attention: Never fly a spiral dive with big ears, because the middle A-lines are loaded beyond their limits.

## **13.3. B-Stall:**

The B-stall is easy to enter with the The Rock<sup>2</sup>. The B-risers are slowly and symmetrically pulled down to 20 cm. The airflow stops and the glider descends vertically.

To exit the manoeuvre it is sufficient to raise the B-risers again in a time of approx. 1 second.

If the glider starts to rotate during the B-stall or if it forms a collar, the flying manoeuvre must be immediately released. The reasons can be: turning: asymmetrical pulling of the risers, 1 B-riser and 1 C-riser pulled down; collar: too excessive pulling of the B-risers.

All descent aids should only be practised in calm air and at a sufficient safety height, preferably as part of a safety training, in order to be able to use them in emergency situations!

## **Summary:**

This is valid for all extreme flight manoeuvres and descent aids:

- first practice only under the guidance of a flight instructor or as part of a safety training course
- before starting the manoeuvres, ensure that the airspace under the pilot is free
- During the manoeuvre the pilot must have eye contact with the canopy and constantly check the altitude.

## **14. Folding, Care, Storage, Repairs, Maintenance, Disposal**

The condition of the paraglider affects your life in the air. A well-kept and properly treated paraglider can reach twice its age. To ensure that the The Rock<sup>2</sup> carries its pilot as long as possible and safely through the air, please consider the following points:

### **Folding:**

For a long durability of the paraglider and to avoid unnecessary kinking of the nylon rods in the nose area, we recommend to fold the glider profile on profile (similar to an accordion), or to roll it together loosely seen from the stabilizer (without kinking the nylon rods). Improper packing and prolonged storage may cause deformation of parts in the glider.

### **Care:**

- The UV rays of the sun damage the fabric of the paraglider in the long run. Therefore the paraglider should not be unnecessarily exposed to sunlight.
- When unfolding the glider, make sure that neither the canopy nor the lines are heavily soiled. The dirt particles can damage the material.
- The line lengths should be checked after tree and water landings.
- Do not pull the paraglider over the ground. The coating of the cloth will be damaged.
- Moisture damages the coating of the cloth and shortens the service life.
- If the lines stick to the ground, they can be overstretched or torn off during take-off.
- Do not step on the lines!



- When folding up, please place the supplied textile bag underneath to avoid mechanical abrasion and damage of the sail.
- The lines should be bended as less as possible.
- After contact with salt water, rinse the equipment immediately with fresh water!
- Insects that got lost in the cells should be removed alive, not only because of animal love, but also because they secrete a corrosive liquid.
- Clean the paraglider only with water. Avoid mechanical stress such as brushing and rubbing. Chemical cleaning agents damage cloth and lines.

### **Storage:**

- The paraglider must always be stored in a dry place. If it gets wet, spread it out to dry as soon as possible (but not in full sunlight!).
- Do not store the glider near chemical vapours or gases.
- During transport and storage, especially in cars, make sure that the paraglider is not exposed to unnecessarily high temperatures.

### **Repairs:**

- Smaller rips in the fabric that do not run along the seam can be provisionally repaired with an adhesive sail from a paraglider dealer.
- All other types of damage, such as large rips, rips at seams, torn line hangpoints, torn and damaged lines may only be repaired by an authorised workshop or the manufacturer.
- Only original spare parts are to be used! A list of the lines used in the glider model can be found in the individual line plan under item 16 "Individual line lengths". The lines can only be purchased from the manufacturer.
- Any modification to the paraglider, except those approved by the manufacturer, will void the operating license of the equipment.

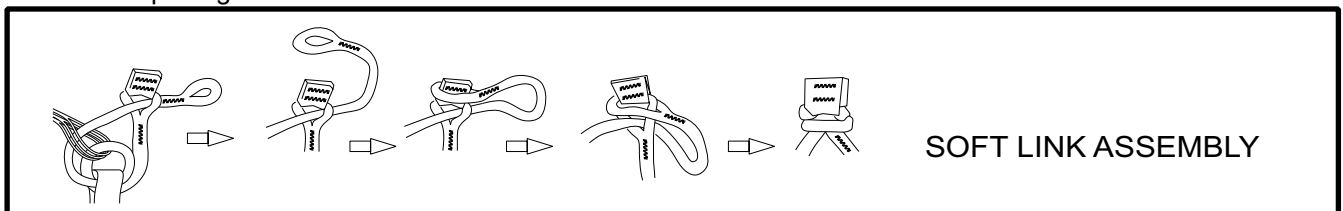
### **Maintenance:**

- The The Rock<sup>2</sup> must be inspected at least every two years or every 100 operating hours by an authorized workshop or by the manufacturer.
- A line measurement should be performed every 20 flying hours and should be compared with the data sheet.

### **Maintenance of the softlinks:**

Instead of metal line locks between the riser and the lines, the Rock2 has soft links. The softlinks consist of a Dyneema rope and are characterised by a very high strength. However, the softlinks must be checked regularly for damage and wear. This must be done after 50 hours of operation at the latest. To do this, the neoprene cover that protects the softlink is pulled completely onto the riser so that it is freely visible. The Softlink is then visually inspected. There must be no visible damage (e.g. fraying) to the rope. If any damage is visible, the softlink must be replaced.

The softlink can be closed without tools as illustrated below. The softlink must only be closed as shown in the sketch below! The opening is done in the reverse order:



### **Disposal:**

- The materials used in a paraglider require proper disposal. Please return used equipment to us. We will dispose them properly.

## **15. Nature and landscape friendly behaviour:**

Actually self-evident, but here again expressly mentioned: Please practice our nature-orientated sport in such a way that nature and landscape are protected!

Please do not walk off the marked paths, leave no rubbish behind, do not make unnecessary noise and respect the sensitive balance in the mountains. Especially at the take-off place our respect to nature is required!



## 16. Line lengths

### Ageing of lines and trimming possibility

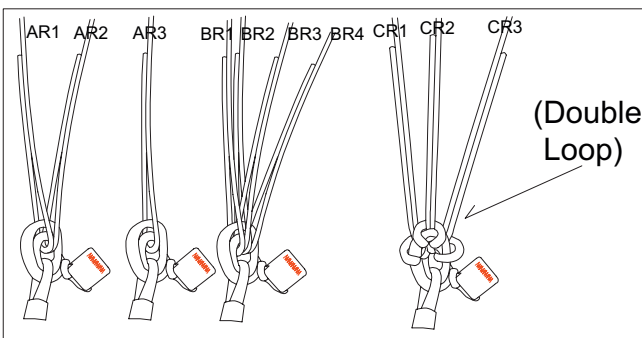
So far it has always been thought that lines stretch under use. In the case of the middle A and B lines - where the heaviest load is attached - this is even true.

All lines (Kevlar as well as Dyneema lines) get cracks in their thin threads and then they begin to swell and shrink. The rear C lines and the outer A, B, C lines are loaded with only a few grams during flying. This leads to a slow shortening of the lines - because there is not enough load on the lines to stretch them during flying. On the technical side, almost nothing can be done. The The Rock<sup>2</sup> is equipped with a minimal faster trim (+mm to C) to avoid this shortening.

Less stressed lines are delivered with a trim knot. This can be used to lengthen the line if necessary.

The service company or the pilot now has the possibility to trim the glider without any problems and without having to replace the lines. A line measurement should be performed every 20 flying hours and should be compared with the data sheet. It is completely normal that lines can shrink by up to 30 mm at very intensive use.

All line changes are gradual. So they do not occur suddenly. You also do not crash, but often you only notice this when you are less able to fly against the wind or when the glider loses some of its performance.



Factory delivered configuration with double loop on C-riser lines for trimming during aging

### Line names:

All lines in Skyman paragliders are named according to the same scheme.

When ordering replacement lines, please always determine the designation according to the following explanation and order it stating the type and size of glider!

The first digit indicates the line level (A, B, C, D; K = brake). The numbering starts from the centre of the glider at 1 and continues to the stabilizer.

Top lines (upper level) are marked with the level and the number starting from the centre of the glider. Example: A 5 = the 5th A-line from the middle of the glider (for The Rock<sup>2</sup> M: 81 cm)

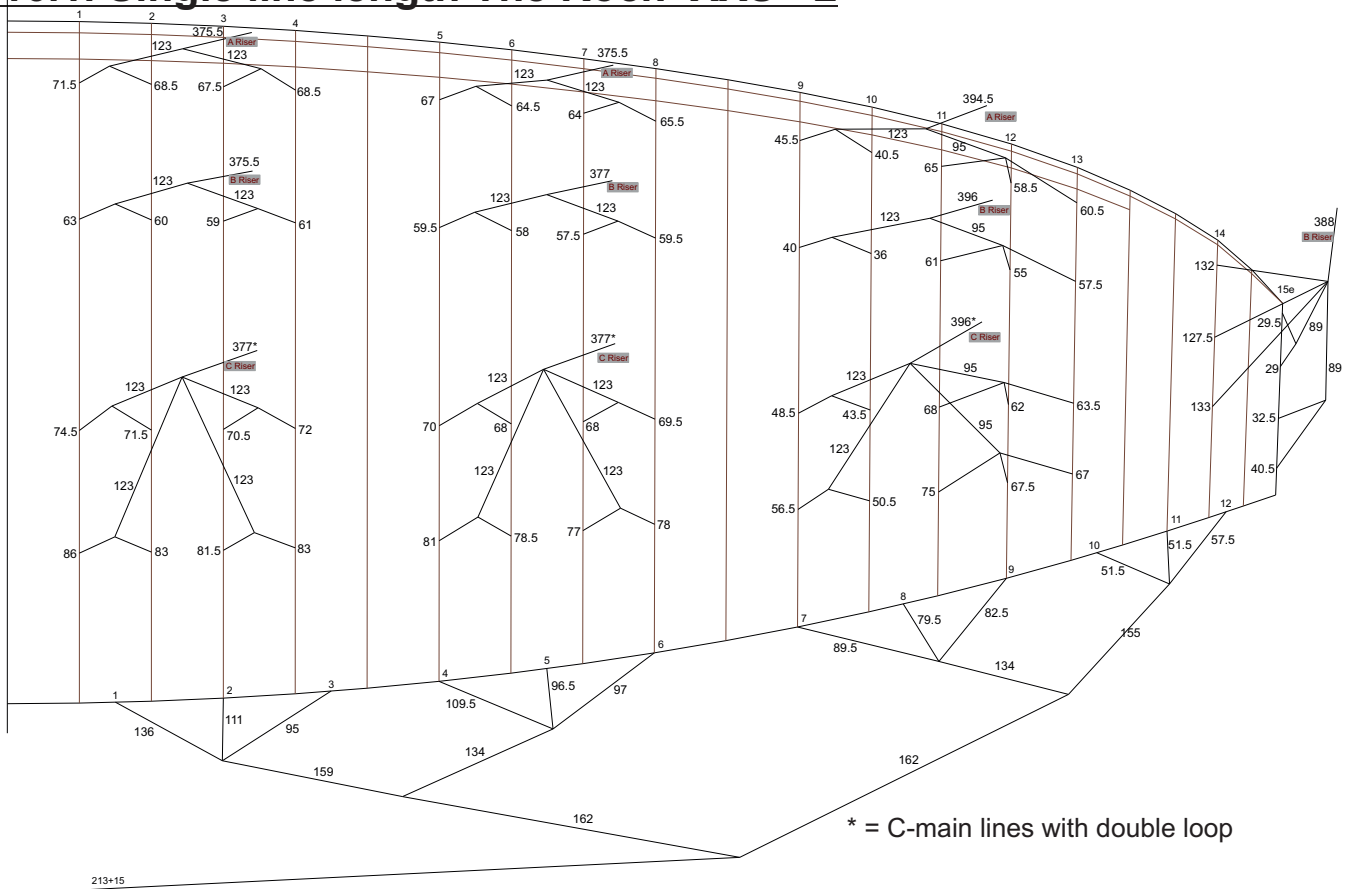
The stabilizer upper line has the additional designation "e". Example: B15E = B-Stabilizer line at the top of the canopy (The Rock<sup>2</sup> M - 39 cm).

Middle lines (middle level) get the designation "M". Example: CM4 = 4th middle line from the centre of the glider on the C-plane (for The Rock<sup>2</sup> M: 137 cm)

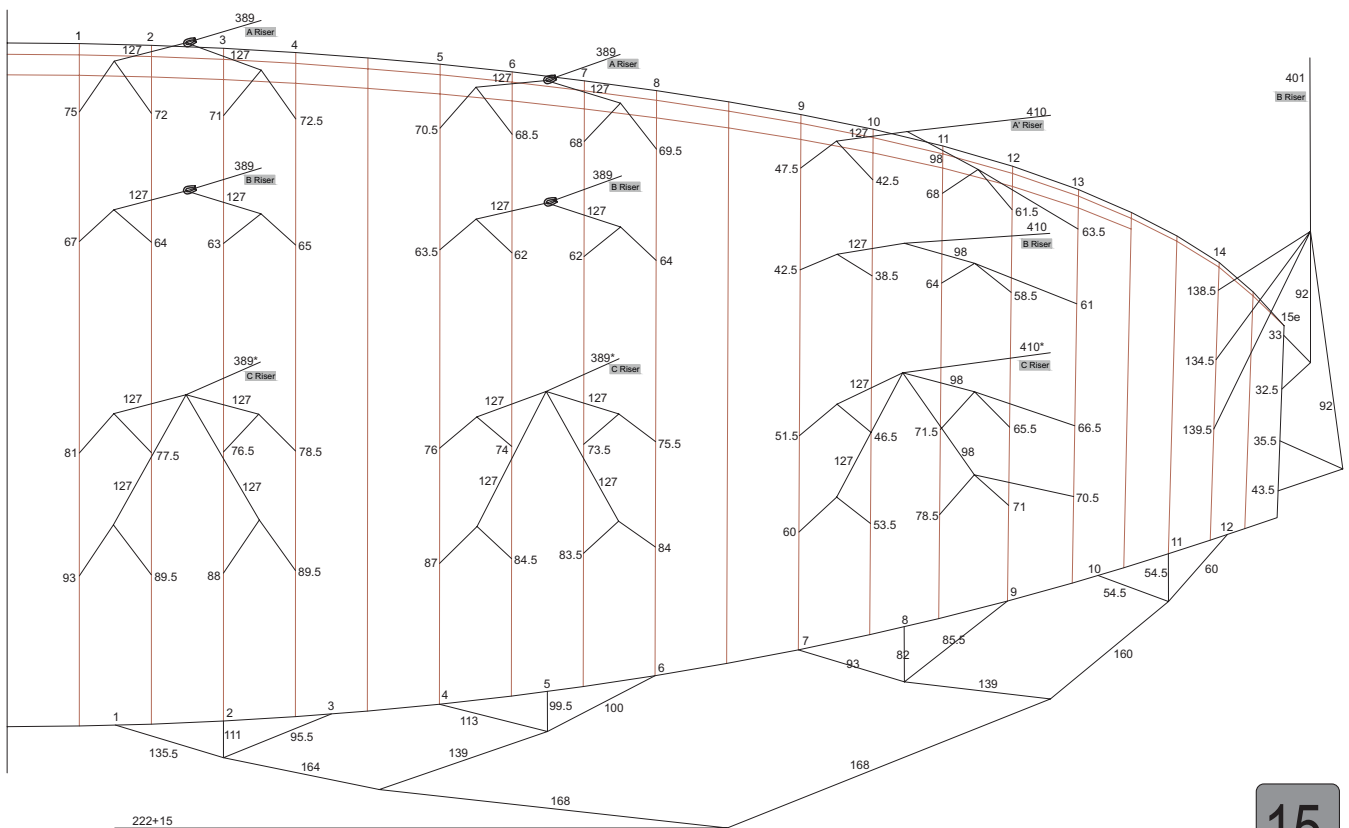
The main lines have the additional wording 'R'. Example: AR3 = 3rd A main line from the centre of the canopy (The Rock<sup>2</sup> M: 442 cm)



## 16.1. Single line length The Rock<sup>2</sup> XXS - 2

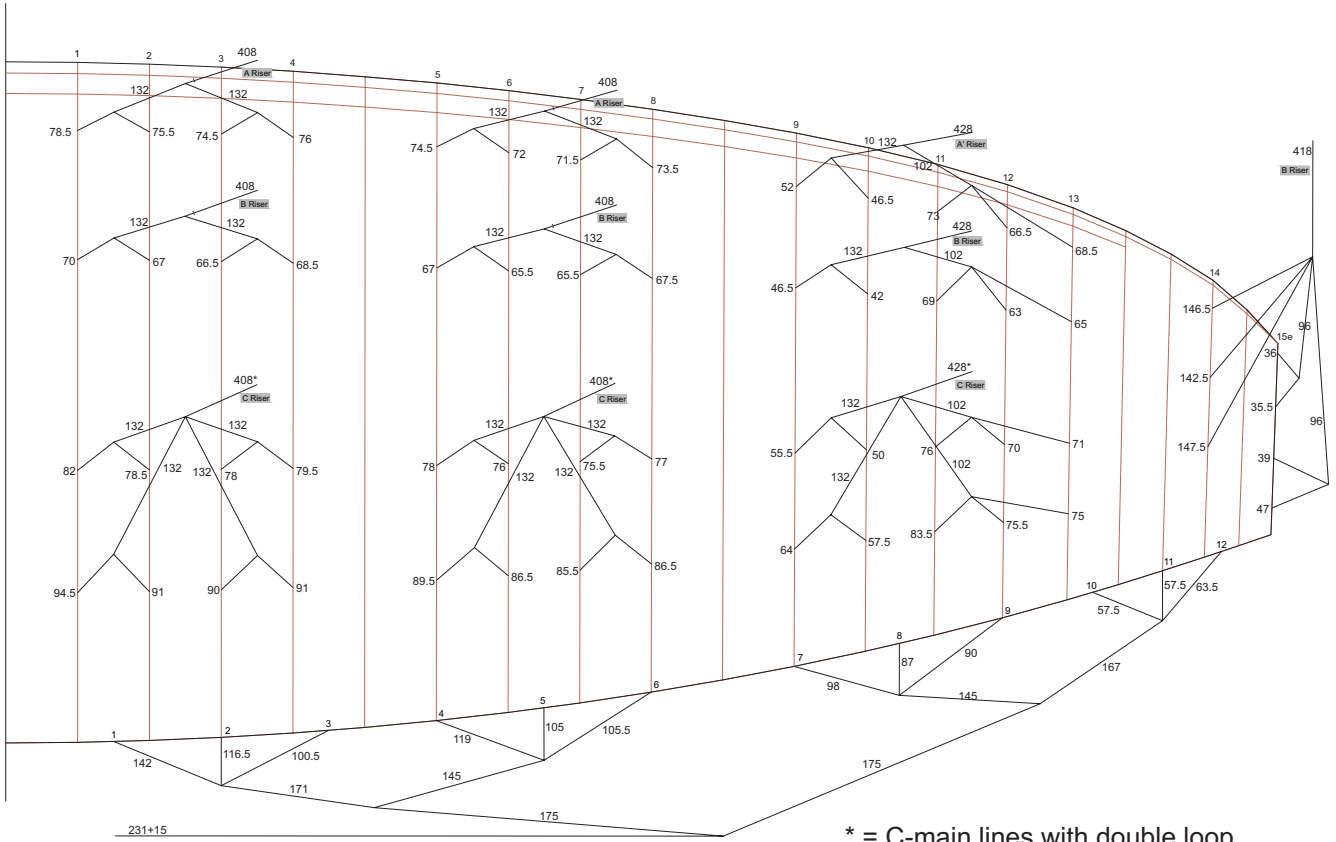


## 16.2. Single line length The Rock<sup>2</sup> XS - 23,5



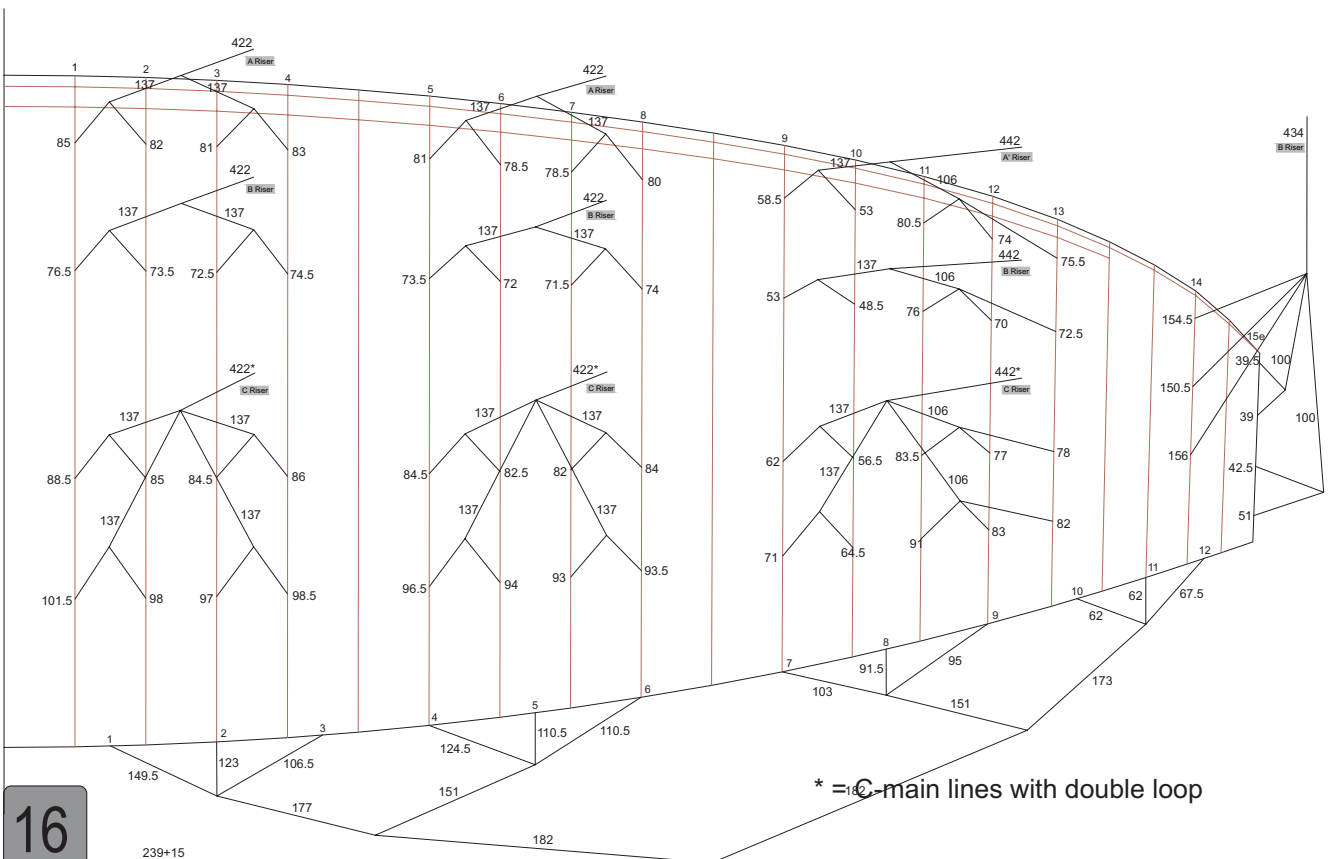


### 16.3. Single line length The Rock<sup>2</sup> S - 25,5



\* = C-main lines with double loop

### 16.4. Single line length The Rock<sup>2</sup> M - 27,5



\* = C-main lines with double loop







### **17.3. Overall line length The Rock<sup>2</sup> S - 25,5**

in mm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Stabi
A	6700	6670	6660	6675	6660	6635	6630	6650	6635	6580	6545	6480	6500	6160	6015
B	6615	6585	6580	6600	6585	6570	6570	6590	6580	6535	6505	6445	6465	6120	6010
C	6720	6685	6680	6695	6680	6660	6655	6670	6655	6600	6560	6500	6510	6170	6045
D	6845	6810	6800	6810	6795	6765	6755	6765	6740	6675	6635	6555	6550	6125	
Bremse	7190	6935	6775	6700	6560	6565	6490	6380	6410	6305	6305	6365			

### **17.4. Overall line length The Rock<sup>2</sup> M - 27**

in mm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Stabi
A	6955	6925	6915	6935	6915	6890	6890	6905	6890	6835	6800	6735	6750	6400	6250
B	6870	6840	6830	6850	6840	6825	6820	6845	6835	6790	6755	6695	6720	6360	6245
C	6975	6940	6935	6950	6935	6915	6910	6930	6910	6855	6815	6750	6760	6415	6280
D	7105	7070	7060	7075	7055	7030	7020	7025	7000	6935	6890	6810	6800	6365	
Bremse	7475	7210	7045	6965	6825	6825	6750	6635	6670	6560	6560	6615			

### **17.5. Overall line length The Rock<sup>2</sup> L - 29**

in mm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Stabi
A	7200	7170	7160	7180	7165	7140	7135	7155	7140	7085	7045	6975	6990	6635	6475
B	7115	7080	7075	7095	7085	7070	7070	7090	7080	7035	7000	6940	6960	6590	6470
C	7225	7190	7180	7200	7185	7165	7160	7180	7160	7105	7060	6995	7005	6645	6505
D	7360	7320	7310	7325	7310	7280	7270	7280	7250	7185	7140	7055	7045	6590	
Bremse	7745	7475	7305	7225	7075	7075	7000	6885	6915	6800	6800	6860			

### **17.6. Riser length The Rock<sup>2</sup>**

mm	normal	accelerated
A	515	365
A`	515	365
B	515	390
C	515	515

Lengths measured from suspension point to lower edge of shackle



## **18. Inspection instructions The Rock<sup>2</sup>**

Attention: Fly market GmbH & Co. KG is not liable for any errors made by the person (or service company) carrying out the inspection. This person (or company) always works on their own responsibility!

If in doubt about the procedure of the inspection or the airworthiness of the equipment, always contact Fly market GmbH & Co. KG or, if necessary, send the equipment directly to us for inspection.

### **18.1. Inspection scope**

- Every paraglider is subject to mandatory inspection.
- The inspections may be carried out by the manufacturer or by a person authorised by the manufacturer who meets the following requirements. Since 01.07.2001 there is also the legal possibility that the owner can check his device himself. This possibility is not recommended by the manufacturer, because the owner usually has not the technical knowledge and necessary measuring equipment available. In addition, in this case the equipment may only be flown by the owner - the use of the paraglider by third parties will then be excluded!! A test report is being drawn up at each inspection. The owner is obliged to always keep the last inspection report and to send a copy of it to the manufacturer. Each inspection step must be carried out conscientiously and entered in the inspection report.
- If a defect is found during the inspection, the glider is not allowed to be flown any further. The glider must be repaired by the manufacturer or a person authorized by the manufacturer.

### **18.2. Inspection intervals**

The intervals for training equipment and commercially used tandem paragliders are every 12 months, all other paragliders every 24 months or after 100 operating hours.

A line measurement should be made every 20 flying hours and compared with the data sheet.

### **18.3. Personnel requirements for the inspection**

Personnel requirements for the inspection of paragliders used only for personal and single-seater use:

- A valid unrestricted pilot's licence for paragliders or an equivalent approved licence.
- Sufficient type-related training at the manufacturer's or importer.  
Note: If a paraglider has been tested exclusively for personal use, its use by third parties is excluded.

Personnel requirements for the inspection of paragliders used by third parties and for two-seaters:

- Vocational training favourable to the examination activity
- A professional activity of two years in the manufacturing or maintenance of paragliders, hang-gliders or similar technical equipment, including 6 months within the last 24 months.
- Sufficient type-related training of at least two weeks at the manufacturer or importer.

### **18.4. Necessary documents**

- Current version of the inspection instructions
- Data sheets
- 
- Previous inspection reports (only for further inspections)
- Maintenance and calibration documents for the measuring instruments
- manufacturer's corrective action instructions
- Airworthiness directive if applicable



## **18.5. Test procedures**

### **Identification of the equipment:**

- Once the paraglider has been handed over, an initial inspection is carried out and the paraglider is identified on the basis of the official manufacturer's documents.
- Check the type label and inscriptions for correctness, completeness and readability.

### **Visual inspection of the canopy:**

- The upper and lower sail, leading edge, trailing edge, ribs (including any V-ribs), cell partitions, seams, flares and line loops are examined for cracks, shearing, stretching, damage to the coating, repairs and other conspicuous features. The test result must be recorded in the inspection report.
- In case of rips at the seams and other damages the repair must be carried out only by original spare parts and original seam pattern, no gluing with adhesive sail, use of non-original spare parts, etc.

### **Visual inspection of the lines:**

- If the lines are damaged (seams, rips, folds, chafe marks, thickenings, core exits, etc.), they must be replaced immediately with original spare parts and original seam pattern.
- In case of injuries to the lines (seam pattern, coat, etc.), they must be replaced immediately with original spare parts and original seam pattern.

### **Visual inspection of the connecting parts**

- All line shackles and any existing trimmers and speed systems must be checked for conspicuous features such as rips, chafing and difficult movement. Both risers are checked for shearing points, tears and heavy wear and then measured under a load of 5 daN. The values determined must be compared with the specifications of the type identification sheet and documented in the inspection report.
- Max +/- 5 mm difference in riser lengths are permissible

### **Measurement of line lengths:**

- The individual lines are laid out and measured loaded with 5 daN. The measurement is carried out from the suspension point of the riser to the canopy including the loop. The rib numbering starts in the middle of each wing and the wing sides are seen in the direction of flight. The total line lengths determined are documented in the inspection report and compared with the nominal line lengths of the corresponding type identification sheet. The measurement of the opposite wing side can be carried out by a symmetry check, if the same conditions are met. Compliance with the tolerances to be taken from the manufacturer's instructions must be documented in the inspection report.
- Limit values (tolerance values) may deviate by a maximum of +/- 10 mm from the type identification sheet, whereby there may be no significant trim shift due to the tolerances. The tolerances of the brake lines are +/- 10 mm deviation from the type identification sheet.
- The restrictive rule is that a fine trim must be carried out in 2 cases (the procedure must be requested from the manufacturer):
  - if more than 50 % of the lines reach the tolerance limit, with the tolerance limit deviating only in either the + or - direction (all values of 5-10 mm are calculated).
  - or 25 % of the lines deviate the tolerance limits in both directions (+ or -) (Example: A/B lines are 5-10 mm longer, while at the same time the C/D lines are 5-10 mm shorter than in the type identification sheet (trim shift to the rear due to ageing)



## Control of line strength:

The proof of line strength should be documented analogously to the proof required in the LTF for the type test:

- Main line: From each line level (A, B, C) a main line is removed from the centre of the glider and the breaking load is determined. The removed lines must be listed in the inspection report (e.g. AR1, BR1, CR1, DR1 in flight direction left). This is important so that the line replaced in the previous test is not checked in a subsequent inspection. In the 3rd and 4th inspections, main lines are checked next to the middle main line (i.e. AR2, BR2, CR2). After the 5th inspection the cycle starts again from the beginning (e.g. AR1, BR1, CR1 in flight direction left, according to the first inspection).
- Above the main line, a further line is removed up to the canopy and the breaking load is also determined. If the determined breaking load of the A-top lines is 1.5 times the nominal value (e.g. nominal value 50 daN, determined breaking load >75 daN), a test of further gallery lines on the B/C/D levels can be omitted.
- Limit values of the individual lines for the The Rock<sup>2</sup>:

Line position	Limit (daN)	Line position	Limit (daN)
AR, BR	150	CM - DM	75
CR	120	A/B 1-8	50
AM, BM	100	A/B 9 - Stabilizer, C/D	35

## Inspection of the canopy strength::

- The testing of the canopy strength is done with the Bettsometer (B.M.A.A. approved Patent No. GB 2270768 Clive Betts Sales). In this test, a needle-thick hole is made in the upper and lower sails in the area of the A-line attachment and the fabric is tested for its tear resistance. The limit value of the measurement is set at 800 g and a crack length of 5 mm.
- The exact test procedure is specified in the operating instructions for the Bettsometer. The measured value determined is entered in the inspection report.

## Inspection of the air permeability of the cloth:

- Using a JDC textile clock, a porosity measurement is carried out at at least 5 points on the upper sail (with at least 2 measuring points in the middle third of the canopy) and at least 3 points on the lower sail. The values determined are recorded in the inspection report. The measuring points on the upper/lower sail are distributed over the span and approx. 20-30 cm behind the leading edge.
- Limit values: no measuring point may reach a value below 10 seconds. If a measurement shows a value of less than 10 seconds, the paraglider loses its airworthiness.

## Visual control of trim and settings:

- All lines must be checked according to the line overview plan to ensure that they have been correctly set and that all line levels are running free. The brake lines must also be checked to ensure that everything is correctly set up and running free.
- The visual inspection must correspond exactly to the line overview plan.



### **Checkflight:**

- A check flight is only necessary after major repairs.
- During the check flight it must be determined whether the flight characteristics of the paraglider being tested have changed compared to a brand-new glider.
- The examiner must be capable of comparing the construction regulations with the flight behaviour of the paraglider to be tested and of determining any changes in the characteristics of the paraglider. This includes above all that the paraglider and its characteristics / flight behaviour are known to the examiner.
- The type certification standards applied at the time of approval of the type must be known.
- A check flight must include at least the following points: take-off behaviour, tendency to deep stall (return from B-stall), tendency to negative curves, steering range lengths, side collapse >50% .
- Wenn das überprüfte Gerät in irgendeiner Weise sich nicht richtig verhält, darf mit diesem Gerät nicht mehr geflogen werden und muss zur Überprüfung zum Hersteller. Keinesfalls darf man selbst versuchen, den Fehler zu beheben.
- 

### **18.6. Inspection equipment**

The test equipment to be used for the individual tests must be the equipment listed below:

- Air Porosity Meter: JDC
- Length measuring device: Measuring tape made of steel or laser measuring device
- Tensile strength device for lines: electronic measurement with maximum value memory, sampling rate > 50 measurements/second
- Strength tester for canopy: Bettometer, B.M.A. GB 2270768 All measuring devices must be calibrated and maintained at regular intervals according to the manufacturer's specifications.

### **18.7. Documentation**

- All test results as well as all details of the glider (type, size, serial number, year of manufacture) must be recorded in the inspection report.
- Repair and maintenance work will also be noted on the inspection report.
- The overall state of the glider is displayed according to the checkboxes of the verification protocol. In the overall state, all determined values such as strength, porosity, etc. are included.
- If the inspection result is negative, contact the manufacturer to agree on the further procedure (e.g. sending the device to the manufacturer for repair).
- Exceptional defects must be reported to the manufacturer immediately!
- The inspection is to be marked on the glider next to the type label with an appropriate inspection stamp or label. The information must include at least the time of the next inspection, place, date, signature and name of the inspector.
- All inspection documents (inspection report and measurement report) shall be prepared in triplicate. The equipment owner, inspector and manufacturer each receive one copy (the copy must be submitted promptly). The retention period for the inspection documents is 6 years.