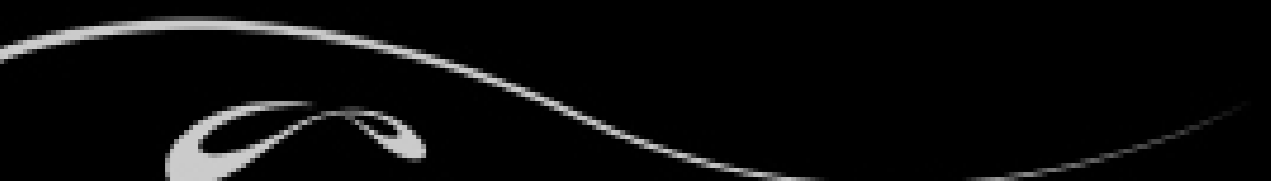


# PARAGLIDER MANUAL

## **TR27**

VERSION 4/2020



Thank you for taking the time to read the TR27 Manual

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## WELCOME TO SOL TEAM!

Thank you for selecting a SOL Paragliders. You have just acquired a high-quality product, manufactured under one of the most demanding industry standards worldwide.

We trust your paraglider will bring you many great life memories you will cherish forever. We would like you to read this manual carefully and thoroughly. In it, you will find important information about using your new equipment.

### **Attention**

This manual is to be read carefully. You'll find important information about your glider and its use.

In the event you should have any questions about its usage or should you wish to be updated on the latest news at **SOL**, we remain at your disposal:

Thank you for selecting a **SOL PARAGLIDERS**.

SOL Team!

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Comes with the glider:

Along with your product, you are getting an accessory kit:

- Big deluxe backpack
- Internal protection bag;
- Easy Check;
- Basic Repair Kit;
- User's Manual;

## WARNING

- This paraglider meets at the time of delivery the requirements of the LTF certification or of the EN!
- Any equipment alteration will result in the cancellation of this respective certification.
- Flying with this equipment shall be performed at the individual's own risk.
- The manufacturer and its representatives are not liable and therefore not responsible for any misuse nor mishandling of this equipment.
- Every pilot is responsible for the maintenance and assessment of equipment usability.
- It is a basic assumption that the pilot is certified to fly this paraglider.
- This manual offers information about your paraglider. It is not a training manual.
- It is a assumption that the pilot respects the law and order of aviation and that his skills are up to the challenge of this particular equipment!



## SAFETY FIRST

### FOR YOUR ADVICE

The safety advices and instructions contained in this manual must be followed in all circumstances. Failure to do so shall render invalid the certification and/or result in loss of insurance cover and could lead to serious injuries or even death.

Paragliding demand a high level of individual responsibility. Prudence and risk-awareness are basic requirements for the safe practice of the sport, for the very reason that it is so easy to learn and practically anyone can do so. Carelessness and overestimating one's own abilities can quickly lead to critical situations. A reliable assessment of conditions for flying is particularly important. Paragliders are not designed to be flown in turbulent weather. Most serious accidents with paragliders are caused by pilots misjudging the weather for flying.

In Germany, paragliders are subject to the guidelines for air sports equipment and must not under any circumstances be flown without a valid certification. Independent experimentation is strictly prohibited. This Manual does not replace the need to attend training at a paragliding school.

The Manual must be passed on to any new owner if the paraglider is sold. It is part of the certification and belongs with the paraglider.

Observe the other specific safety advice in the various sections of this Manual.

### SAFETY NOTICES

Safety notices are issued when defects arise during use of a paraglider which could possibly also affect other gliders of the same model. The notices contain instructions on how the affected gliders can be inspected for possible faults and the steps required to rectify them.

SOL Paragliders publishes on its website any technical safety notices and airworthiness instructions which are issued in respect of SOL products. The paraglider owner is responsible for carrying out the action required by the safety notice. Safety notices are issued by the certification agencies and published on the relevant websites. You should therefore visit on a regular basis the safety pages of the certification agencies and keep up-to-date with new safety notices which cover any products relating to paragliding.

### OPERATING LIMITATIONS

The paraglider must be operated only within the operating limits. These are exceeded, if one or more of the following points are compiled:

- the take-off weight is not within the permissible weight range
- the glider is flown in rain or drizzle, cloud, fog and / or snow
- the canopy is wet

- there are turbulent weather conditions or wind speeds on launch higher than 2/3 of the maximum flyable airspeed of the glider (varies according to the total take-off weight)
- air temperature below -10°C and above 50°C
- the glider is used for aerobatics/extreme flying or flight maneuvers at an angle greater than 90°
- there have been modifications to the canopy, lines or risers which have not been approved

### RESERVE

It is a mandatory requirement to carry an approved reserve for use in emergency situations where the paraglider fails, and recovery is not possible, for example after colliding with another aerial sports craft. In choosing a reserve, you should be careful that you remain within the specified take-off weight. The reserve is fitted according to the manufacturer's instructions.

### GLIDER CATEGORY AND GUIDELINES

The TR 27 received a CCC certification in the final classification by the licensing company.

#### **Warning**

The descriptions of flight characteristics contained in this Manual are all based on experiences from the test flights, which were carried out under standardized conditions. The classification is merely a description of the reactions to these standard tests.

The complexity of the paraglider system means that it is not possible to give any more than a partial description of the glider's flight behavior and reactions to disturbances. Even a small alteration in individual parameters can result in flight behavior which is markedly modified and different from the description given.

#### Description of flight characteristics

Paragliders with a CCC certification have demanding flying characteristics and potentially violent reactions to turbulence and pilot errors. Recovery to normal flight requires precise pilot input.

#### Target group and recommended flying experience

Performance pilots with extensive flying experience of at least approx. 75 hours airtime per year, who wish to fly at a top performance level in, e.g. cross-country flying.

The TR 27 is designed from the outset as a CCC competition glider and has the highest performance. It is suitable for the very experienced pilot who flies frequently and wants the highest possible performance and is aware of the risks associated with high performance gliders and has the skills to handle such wings and the extreme flight maneuvers in this class.

## Description of pilot skills required

Designed for pilots well-practiced in recovery techniques, who fly very actively, have significant experience of flying in turbulent conditions, and who accept the implications of flying such a wing.

## Suitability for training

The TR 27 is generally not suitable for use as a training glider.

## First Flight

Your instructor, dealer or a specialist must test-fly and inspect the paraglider before your first flight. The test-flight must be recorded on the paraglider information label. Any changes or improper repairs to this paraglider shall render invalid the certification and warranty.

## TR 27 - WELCOME ON BOARD

TR 27, is a C-class (former class 2-3) paraglider with high performance for experienced pilots. He corresponds a light air sport equipment with less than 120 kg of weight. The precise handling of the TR 27 delivers an excellent performance in thermals and during transition time. This is most important for very good flights. We all know that 50% our flight time is spent in climbing thermals. That's the reason we invested all we can to create a project who has a great advantage in this area in comparison with other models of the same class at the market.

SOL Paragliders is known for products with long life, quality and performance. Our research and test flights are mostly done with canopies for competition and acro-flight. This is a great base to choose the materials.

The project of TR 27 reduced the weight of the paraglider. We used only WTX40-40 Gr/m<sup>2</sup> to produce the glider. Also, we could reduce even more the aerodynamic drag using competition lines of Vectran and small risers. And of course, we designed the glider to not lose any performance with the years.

We are confident to say, that this paraglider is the best balance at the market between weight, performance and long life.

## BEFORE THE FIRST FLIGHT

### ADJUSTING YOUR SPEED SYSTEM

Most of the latest harnesses have pulleys for assembling the foot speed system. In the eventuality the pulleys are not there, it is important to attach such pulleys (sewing them) in such way to make the operation of the speed system softer.

The little chord on the speed system must be firmly attached (by a non-slippery knot) to the stirrup (aluminum bar). The other end of the cable is fed through the harness' pulleys and comes out vertically, and firmly attached to a Quick Link with a strong coil, a quick hook-up or preferably closed by a nut.

To adjust the Speed System, we suggest that you connect the harness and the risers together, suspended from the ground. Ask a friend to pull the risers 'A' upwards. Currently, adjust the length right to the bar in such way to be easily reachable with your feet in flight and by stretching the legs, make sure to allow for a clear path to maximize the accelerator usage.

The pilot activates the speed system by pushing the stirrup forward. The pulleys on the risers reduce to 2/3 the necessary energy and the risers at the front are shortened. Before takeoff, the Quick Hook-Up or the Quick Link must be connected at the ring on the speed system risers. It is important to note that the little chord must run free of snags. The rubbing with the risers may cause damage.

The Paraglider has no further technical parts that can be adjusted.

### **Warning**

- In incorrect system assembly, that allows for different measurements other than the indicated above nullifies the certification!
- Remember that when using the speed system, the angle of attack decreases which may result in the collapse of the paraglider, consequently, the use of the speed system close to the ground should be avoided. We do not recommend the use of the speed system in turbulent conditions.
- Never use the speed system in extreme maneuvers.
- In the event the canopy collapses, release the stirrup immediately and make the appropriate corrections.
- Never let go of the toggles!

### TR27 - HARNESS

The TR 27 was tested with a harness LTF Type GH. Any harness of type ABS are recommended for the TR 27, tested with large clips set at 42 cm and 47 cm heights from the board, depending on the harness size. Care must be taken because the large clips height affects the brake position when set at 'normal'.

The regulated distance between the large clips (adjustable at the chest) is 42 cm for the paraglider size "S" and "M", 44cm for size "L" and 46 cm for size "XL". Variations of more than 5 cm above these ones will alter the fundamental characteristics of the canopy and are potentially dangerous.

SOL Paragliders give free together all gliders and harnesses, a Measuring Tape "Easy Check" to help pilots to check the distance between carabines.

The measurement must be made at the points indicated in the foto:

### **Warning**

- Cross straps may jeopardize flying and do not improve safety.

## TAKEOFF WEIGHT

The TR 27 has been certified for a defined weight range. If your weight range falls between two sizes, we recommend the following:

- 1) If you desire better speed, accurate commands, and if you usually fly over mountains and/or extreme conditions, you should choose to fly near the middle to maximum suggested weight.
- 2) If you desire a better sink ratio, and if you usually fly above flat elevations, and light conditions, you should choose to fly near the minimum suggested weight.

## TR27 - FLIGHT

### FIRST FLIGHT

A careful First Flight is necessary with every paraglider, the TR 27 is no exception. This flight must take place on a practice hill. After unpacking the paraglider and laying out in a horseshoe shape position, the following steps must be taken:

- The paraglider must be laid out in such a way that, when tension is applied to risers 'A', the canopy center should be extended before the extremities. This allows for an easy takeoff with good directional stability.
- Special attention must be taken to the wind's direction upon the lifting of the canopy, so that the two halves are inflated symmetrically.
- All lines must be organized and completely free of any entanglements. Special attention must also be given to the lines 'A', which must be free right from the risers 'A' (with the red mark) to the canopy.
- Same priority and care must be given to the brake lines, which must also be completely free and without any possibility of entanglement on any obstacle during takeoff.
- All lines should be checked and all the risers in appropriate order. When the risers are aligned and not twisted, the brake lines will be free from the pulleys (on the rear risers) to the canopy's rear edge.
- It is extremely important that no entanglements nor bunched lines are present.
- Any line going under the canopy or tie may result in disastrous consequences.
- Before and after each flight the lines, risers and canopy must be checked for any possible damage.
- In case there is any damage present, as insignificant as it may be, the canopy should not be flown!

### **Warning**

- It is not advisable to fly the TR 27 in rainy days or with a wet paraglider, since the in-flight maneuvers become more sensitive and a reserve deployment may occur upon exiting a B-Stall or in the event of excessive usage of breaks.

## TAKEOFF PRE-FLIGHT CHECKLIST - DO NOT FORGET

- Make sure reserve is OK! Opening device and pins activated?
- Helmet?
- Carbines closed?
- Harness – Connected all Locks closed?
- 'A' risers in hands?
- Untangled brakes in hand?
- Are you in the center of the canopy?
- Takeoff path is clear?
- Paraglider and pilot aligned with the wind?
- Airspace ahead of takeoff area is clear?
- Distance between carbines is correct?

## TAKEOFF

### Forward Takeoff

It's very easy to fly the TR 27. When ready to takeoff, the pilot must take risers 'A', 'A1' together with the toggles. In order to differentiate between the lines, line 'A' and risers 'A' inclusive are marked with a different color.

Before takeoff, a last check is required to ensure all the equipment is laid out properly. The arms must be extended to the side, as if they are extensions of risers 'A'. A decisive run allows for a quick and stable inflation.

Canopy overtakes are not common. After the initial inflation momentum, the pilot must keep the tension forward on risers 'A' (pushing them ahead, and not pulling them downwards), until the canopy is above your head. At this point, the brakes must be carefully activated, ensuring room for the possibility of directional changes. A move to underneath the center of the paraglider is the best method for corrections, provided there is room for it. The pilot glances at last upwards to ensure the canopy is properly located above, completely unobstructed and inflated. At this point, the pilot decides whether or not to takeoff.

### Reverse Takeoff

Reverse takeoffs in strong wind conditions are also very easy to execute. Due to risk of takeoff with entangled lines (twist), it is highly recommended to take some time and practice reverse takeoffs on a small, leveled hill initially.

### Line knots or tangles

If you do take off with a line knot or tangle, try to get clear of the ground and any traffic before taking corrective action. Weight shift and/or counter brake to the opposite side and pump the knotted side with your brake. Be careful not to fly too slowly to avoid a stall or spin. If the knot or tangle is too tight to pump out, immediately fly to the landing zone and land safely.

## Installation of tow release and auxiliary adaptation

The TR 27 can be used for towed flight if it is connected to the towed flight system (Tow release). It must be connected to the same carabines that join the harness with the paraglider. It is activated through an activator that is strategically located and when is pulled it releases the equipment to fly.

During the taking off it's necessary to avoid a small angle of the cable with the ground.

A taking off with tow release help needs instructions and appropriate procedures. Make sure that you have the necessary knowledge and that the operation is made in a safe and correct way.

## NORMAL FLIGHT

The TR 27 in its normal flight, performs better with the hands lifted. Applying 20- 25 cm the canopy enters safely the minimum speed range. To accelerate, use the speed stirrup.

Maximum symmetric way of brake lines , by maximum weight:

Size XS / S:	46 cm.	Size L:	50 cm.
Size M:	50 cm.	Size XL:	54 cm.

## THERMALING AND SOARING

In turbulent conditions, the paraglider must be flown with the brakes softly applied. An increase in angle of attack is achieved by this measure, resulting in greater canopy stability.

The pendulum effect back and forth must be avoided! The canopy must remain on top of the pilot. For this purpose, the speed must be increased by releasing the brakes upon entering a thermal (depending on its intensity) or braking on exit. This is part of the basic technique on active flying.

During flights over the lift, it is highly recommended a minimum height of 50m be kept, for safety reasons.

It is extremely important to know and respect flying regulations, especially so when the airspace within close proximities of canyons is shared among several pilots, where last minute anti-collision maneuvers are not executable.

## TURNS

The TR 27 is very sensitive, responding instantly to turn commands. Leveled turns can be achieved with the shifting of weight on the risers with minimum altitude loss.

A combination of weight shifting, and breaking technique is the most efficient way of executing turns in any situation. The given brake utilized determines the radius of turns.

By activating the brakes on the outside edge of the turns, as well as applying maximum weight shifting on the risers, the efficiency and resistance to collapse in turbulences (at the edge of thermals) is increased.

In case it becomes necessary to perform turns in a constrained space with the TR 27, we recommend you release the outside brake in the given turn and pull a little more the brake on the inside of the turn.

The TR 27 glides best when no brakes are applied.

## **Warning**

By pulling either brake too strongly or suddenly, there is a danger of creating a negative spiral!

## B-RISER CONTROL

The TR 27 responds very nicely to B-riser control. With the speed system applied the B risers can be pulled backwards towards the pilot to directly control the angle of attack of the glider. Pulling backwards pitches the wing nose-up, increasing the angle of attack, and reduces the chordwise compression in the sail from the lines, making the wing more tuck-resistant. The control movement is subtle and fluid, and only small movements are required. It is important to recognize how much B-riser movement is needed to return the glider to trim speed. The riser-limiters provide a good indicator of when trim speed is approached, making it clear when the maillons are getting close to level (which is a sensible limit to the amount of B-riser control that should be applied). B-riser control can be used to fluidly pilot the wing through turbulence by controlling pitch. The aim should be to control pitch so that the wing stays directly above you. B-riser control can also be used for steering. It is good practice to always glide with gentle tension applied to the B-risers (pulling them backwards about 5cm) so that you can feel the inputs from the wing. Those inputs warn you when turbulence is coming, but also allow you to feel the lifty side of the wing – when the tension on the B-riser on one side increases, pull back on that side to turn slightly towards the lifting air. Following lifting lines using the B-risers this way can make a huge difference to flight performance and gives the TR 27 pilot a very satisfying feeling of being connected to the air movements. A pilot fully in tune with the TR 27 can use these B-riser inputs to follow the lifty lines that lead to the cores of thermals.

## ACCELERATED FLIGHT

It is recommended to use the accelerator when flying against the wind or in descending current zones. Due to a decreased angle of attack, the canopy may collapse easier than when set at the normal position. The pilot must remember that the higher the speed, the more dynamic the collapse response or symmetric closing will be.

## FLIGHT IN TURBULENT CONDITIONS

In turbulent conditions it is not recommended to fly the glider with full speed, cause the TR 27 is than more sensitive to deformation and closing. You must remember that the higher the speed, the more dynamic the collapse response or symmetric closing will be.



## **Warning**

The TR 27 requires active flying in turbulences! This can avoid canopy closings and deformations.

### ACTIVE FLIGHT

For best performance during your flight, it is important to be always sensitive to what your canopy is trying to communicate. The key elements of active flying are the advancements and tension control. When the canopy moves ahead of you, carefully apply the brakes, so that the canopy returns to be above you, and if the canopy moves behind you, you must release the brakes. Flying with the brakes lightly applied (+- 20 cm) allows the canopy to fly slightly behind. In turbulent circumstances the internal paraglider tension may change, which you will feel on the brakes. The idea is to maintain a constant tension, and in case you feel loss of tension, apply the brake.

Avoid flying excessively with the brakes on because you might brake to the point of stopping the canopy from flying. Always consider your aerodynamic speed. Your movements can be symmetric or asymmetric and both or one brake can be applied. We suggest that you do ground practice runs and advancing simulations. Tension loss can be simulated well on the ground.

## **Warning**

- Neither pilot nor any paraglider are immune to collapses; therefore active flying will decrease the chances of happening.
- Always maintain altitude awareness and do not get into excessive commanding mode. We advise you to maintain brake tension and avoid flying in extreme turbulent conditions.

### LANDING

It's very easy to land with the TR 27. The final approach stage must be done in straight line upwind. During this final glide, the paraglider must be decelerated slowly and at about 1 m from the ground the pilot must stall the canopy, according to the conditions.

With a strong nose wind, the pilot should break only slightly or eventually don't even brake at all, and utilizing just the risers 'B' to de-inflate and overcome the canopy after the landing. By breaking during a landing in strong wind conditions, you may expose the canopy to the wind, which could lead to the pilot being dragged backwards.

The final approach must be done always in a straight line. Sharp and alternating turns may produce a dangerous pendulum movement close to the ground.

### MOTORIZED FLIGHT, ACROBATIC FLIGHT AND TANDEM FLIGHT

The TR 27 has not been designed for motorized flight, or acrobatics. This project is designed for only one pilot without passenger.

## TR 27 - FAST DESCENT MANEUVERS

### **Warning**

- All fast descent maneuvers must be executed in light conditions and at sufficient altitude, so that they can be performed as necessary under extreme flying conditions.
- 'Full Stalls' and negative spirals must be avoided, regardless of the paraglider being flown. Incorrect recoveries and exits can result in disastrous consequences.
- The best flight technique is to fly safely and correctly. This way you will never need to descend rapidly!

### EARS

By pulling simultaneously the external riser A' at about 18 cm, the canopy tips will close. The canopy remains completely maneuverable through the activating of unilateral brakes or the shifting of weight towards the risers, flying at a fast descending rate (up to approximately 5m/s). In order to recover, the pilot must release the external riser A' lines. Usually the canopy re-opens by itself, but the pilot can assist with a long and quick pumping.

### **Warning**

- SOL Paragliders does not recommend combining of ears and spirals, as this may exceed the allowable load.

### POSITIVE SPIRAL

Spirals carry a high rate of descent. Therefore, high accelerations (G) make it impossible to hold them for an extended period of time. The spiral force may cause the pilot to faint and to lose flying controls, and crash. Furthermore, they will exert a lot of force and affect the pilot and equipment alike.

The pilot should never exercise this maneuver in turbulences or with wide lateral angles. In windy conditions, the pilot must be aware of oscillations during the maneuver.

When the pilot activates just one brake, slowly and progressively, the paraglider inclines sideways in a sharp angle and enters a steep and quick turn, which may become a positive spiral.

During a spiral the rotation radius can be controlled by the greatest or smallest force applied to the inside brake.

To come out of it, the pilot must release the brake slowly and shift his/her weight lightly to the outside of the turn. A sudden exit may result in an exaggerated momentum forward of the canopy and collapsing it. For this reason, on exiting the last turn, the inside brake of a given turn must be softly applied again.

In case the canopy collapses during this process, the spiral must be counter-acted, as the active canopy area will be reduced.

### **Warning**

- Never combine ears with spirals. The canopy active area reduction plus the 'G' force, by the centrifugal effect, may result in line and/or canopy damage.
- Exiting of any spiral at great speeds must be piloted.
- This maneuver requires high altitudes (at least 600 meters over ground) and is dangerous due high descent ratio pilot can lose the altitude reference. Never do this maneuver without sufficient experience.

### **B3-DESCENT**

To increase your sink rate, first apply a little speed bar (about 25%) and then pull in the (outer) B3 lines simultaneously, firmly, and progressively. To exit the maneuver, release the tips simultaneously and progressively and then release the speed bar.

### **B-STOLL**

To induce a 'B-Stall', the pilot must pull the risers 'B' simultaneously, between 15 and 20 cm. There will be a shift of air flow on the outer layer and the canopy will initiate a parachutal phase.

By releasing the risers 'B' quickly the airflow recoils on the outer layer and the canopy returns to its normal flight position. In case the canopy does not recover to normal flight, refer to the section on Wraps. The momentum of return creates a forward motion by the canopy. We recommend avoiding braking the paraglider eliminating the possibility of a parachutal stall.

The load applied on the 'B' lines during this maneuver is not beneficial to your paraglider. Use this maneuver only in emergencies. In the event risers 'B' are pulled too quickly or too deeply, a horseshoe may occur towards the front. To regain normal flight, the pilot must apply the brakes lightly.

## **TR 27 - BEHAVIOR IN EXTREME MANEUVERS AND COLLAPSES**

Pilot error, extreme wind conditions or turbulence which goes unnoticed by the pilot for too long may leave the wing in an unusual flying position, requiring special reaction and skills on the part of the pilot. The best way to learn how to react calmly and correctly in a serious situation is to attend safety training, where you will learn how to manage extreme situations under the guidance of a professional.

Ground-training is another safe and effective method of familiarizing yourself with your glider's reactions. Launch can be practiced, as can small flying maneuvers, such as stall, asymmetric collapse, front stall etc.

Any pilot who flies in turbulent conditions or who makes an error in handling the glider is at risk of getting into an extreme situation. All the extreme flight figures and flight attitudes described here are dangerous if they are carried out with inadequate knowledge, without the right safety altitude or without training.

Always keep within the recommended limits. Avoid aerobatics and extreme loading such as spirals and big ears. This will prevent accidents and avoid over-loading the glider.

In turbulent conditions, always keep enough distance from rock faces and other obstacles. Time and sufficient altitude are needed to recover from extreme situations.

Deploy your reserve if the corrective maneuvers described in the following sections do not return the glider to a controllable flying position or if there is not enough altitude for correction.

### **SAFETY TRAINING**

The TR 27 is optimized for competition paragliding and is intended only for professional pilots who can demonstrate above-average experience in safety training. The TR 27 is under no circumstances suitable for a pilot's first experience with safety training.

Special folding lines were used for certification of the TR 27 (refer here also to the section "Folding lines"). Without these folding lines, tucks and front stalls may vary from the CCC guidelines.

### **MATERIAL STRESS AND DAMAGE**

SOL Paragliders Gliders advises against subjecting the materials of the TR 27 to excessive stress during a safety training course. Uncontrolled flight positions can occur during safety training, which are outside the manufacturer's limits for the paraglider and which can put the glider under excessive stress.

Trimming the line lengths and canopy material after safety training can lead to a general deterioration in flight characteristics.

Damage because of safety training is not covered by the warranty.

### **Warning**

- Extreme maneuvers must be executed under the supervision of a qualified instructor, on safe courses and with the entire infrastructure available for above ground and water flying!

### **LATERAL ASYMMETRIC CLOSING**

Like any other canopy, a negative angle of attack will result in a closing. In order to maintain directional control upon a lateral asymmetric closing, the brakes must be applied on the open side. In case of a major closing, the amount of braking must be well graduated, in such way to avoid the airflow displacement (stall) on the open section of the canopy.

To facilitate the canopy re-inflation during a collapse, the steps above must be followed in conjunction with a long and slow brake pumping action (2 seconds) with the toggle on the closed side. The shifting of weight on the opposite side riser of the closing will also assist with the re-inflation and increase safety, requiring less brake action and keeping away from the stall point.

In case the pilot does not compensate with the brakes, the TR 27 in most situations will inflate by itself even in major asymmetric collapses. The TR 27 can make a complete turn and in the event, it does not open on its own.

Without action, the paraglider will begin a positive spiral. The pilot must lightly apply the brake on the external side to stop a spiral and at the same time shift his/her weight on the same side until the canopy is stabilized. Exactly at this stage of pendulum effect under the canopy, it is important that the pilot controls carefully the amount of force applied on the brakes, and often it is needed to decrease the force. Once a straight flight is achieved, the closed side can be re-inflated by the pumping action.

### **Warning**

- If the pilot does not actively terminate the spiral, it will continue all the way to the ground!

### LINE-OVER

In the eventuality of lines going over the canopy during flight, the pilot must take the following steps:

- Try to maintain a straight flight: Shift the weight to the open side of the paraglider and assist with a light brake tension on the open side.
- To re-open: Pull the stabilizer line on the closed side until the line entanglement is cleared.
- If the line-over is serious, if it's not possible to maintain a stable flight (spiral) and if there is sufficient altitude (>400 m), there is a chance of resolving this mal-function by executing a 'Full Stall'. In case the above maneuver does not solve the problem, or if the altitude is not sufficient, the pilot can activate the emergency parachute (reserve).

### **Warning**

- Line-overs are generally the result of poor preparation before takeoff, collapses during acrobatics or lateral asymmetric closings.

### FRONTAL SYMMETRIC CLOSING

Risers A and A` are tightly pulled until a complete closing of the Leading edge is achieved, then quickly release the risers until it is closed. The pilot should not hold the risers after the closing. Special attention must be given to ensure enough altitude is available.

The TR 27, on most instances, recovers on its own from a frontal asymmetric closing. In turbulent conditions, a head butt may occur, which must be overcome by accurate brake control

### PARACHUTAL

The TR 27 does not have parachutal stall tendencies and recovers on its own from an intentional parachutal stall induced by braking commands. In the event of a parachutal stall upon coming out of a B-Stall, it is enough just to pull the risers 'A' downwards or the accelerator, thus reducing the angle of attack, therefore reorganizing the air flow contact to the canopy.

### FULL STALL

To create a 'Full Stall', the pilot must pull both brakes to the end, and hold them tightly in this position. In this situation, the TR 27 flies in most times on reverse, in a forward horseshoe shaped tie.

The canopy must be stabilized before the procedure for normal flight re-entry is initiated. Any attempt of recover during the beginning stages of a stall, when the paraglider reverses suddenly can result in a sudden push forward of the canopy. When recovering from a 'Full Stall', both brakes must be released slowly simultaneously and symmetrically (> = 1 second). The TR 27 will move forward gradually and begin normal flying.

An asymmetric recovery (releasing one brake before the other) of a 'Full Stall' is utilized only by test pilots to simulate a paraglider being expelled out of a thermal and must not be attempted by pilots!

### NEGATIVE TURNS

To induce a fast Negative Turn out of normal velocity (LTF) or starting from the minimum speed (EN), the pilot must pull tightly and quickly one toggle right to the end of it. During the negative spiral, the canopy rotates relatively fast around its center, with its inner side flying backwards.

When entering an unintentional Negative Turn, the pilot must recover as soon as it is noticed by releasing the brake slightly so that the canopy will accelerate and returns to a stable flight, without losing too much altitude.

When a negative turn is intentionally prolonged, the TR 27 accelerates forward asymmetrically. A frontal asymmetric closing should not be under-estimated.

To recover from an intentional negative spiral, the pilot must release the pulled brake and pay close attention to a strong canopy surge ahead.

### EMERGENCY FLYING

In case braking controls are impossible, the canopy can be driven by utilizing risers 'B' and eventually land. Pay close attention to the length of the command, which should be shorter than braking commands.

### WINGOVER

To perform a 'Wingover' the pilot must generate a strong pendulum effect by alternating turns on both sides. A complete closing of the canopy is possible.

### **Warning**

- A turn with an incline beyond 60° is considered acrobatic.

### OTHER TIPS FOR DANGEROUS SITUATIONS

#### Cascade

Many reserve deployments are a result of a cascade of over-corrections by the pilot. Please note that over-corrections are often worse than no input at all.

## Flying in the rain

We strongly advise you not to fly in the rain on any paraglider including the TR 27. If you do fly in the rain, be aware that you will have a greater risk of entering a deep stall. It is wise to apply speed bar after passing through rain until you are confident that the glider is flying normally and has preferably dried out so that there is no longer any risk of deep stall.

Flying in extremely humid weather or in rain is outside of the operating limits of the glider. If you are not able to avoid flying in rain, please observe the following:

- it is advisable to fly with slight acceleration during and after the rain (min. 30% or more)
- use no brake input or as little as possible
- control travel reduces
- avoid tight turns, especially in the final approach. If conditions allow, you should also fly slightly accelerated in this phase
- avoid large angles of attack and the possible early stall near the ground (release the speed bar only slowly)

## Advertising and adhesives

Always make sure before attaching advertising to the glider that the adhesive planned will not alter the glider's flight behavior. If you are in doubt, we recommend that you do not attach the adhesive. Attaching adhesives to the glider which are large, heavy, or made of unsuitable material may result in revocation of the certification.

## Overloading

The glider structure is put under high levels of strain in particular on extreme flight maneuvers, rapid descent methods (spiral dives) or prohibited aerobatic maneuvers. They considerably accelerate the aging process of the structure and should therefore be avoided.

The glider must be inspected earlier than is usually the case if it has been put under more than the usual degree of strain.

## Sand and salt air

In many cases, sand and salt air cause the lines and fabric to age much more rapidly. If you often fly near the sea, the glider should be inspected more frequently than normally required.

## Temperature range

Temperatures under -10 °C and over +50°C can make the paraglider unfit to fly. The manufacturer's warranty will lapse if the glider is used outside of this temperature range.

## TR 27 - UP-KEEP AND CARE

A good maintenance extends the life of your TR 27 for many years to come.

### STORAGE

The TR 27 fabric is made mainly out of Nylon, which like any other synthetic material is sensitive to UV light radiation, causing it to decompose, losing its mechanical resistance, and thus increasing its porosity. For this reason, the unnecessary exposure to sun light, which carries a high UV radiation level in high altitudes must be avoided. It is highly recommended to leave the paraglider stored away and well protected when it's not being used in a dry place, protected from UV light and away from chemical products. Avoid keeping the paraglider in places with high temperature (trunk of the car).

### Warning

- After an accident or long time without using the paraglider must be checked.

### BACKPACK

Your backpack was designed with comfort and practicality in mind. It's format allows for good content distribution. Shoulder straps and back support are padded so that comfort is not compromised during walks.

### FOLDING YOUR PARAGLIDER

By following each step properly, you will be helping to preserve the life span of your equipment:

- Open the canopy completely on the ground.
- Place all the lines spread by the inner layer and risers in the middle outside the canopy on the trailing edge.
- We recommend folding your paraglider like an accordion. This will keep the profile reinforcements (Mylar/Carbon) from being crumpled and/or folded. By using this folding method, the paraglider will keep its takeoff and flight characteristics for longer.
- Keep folding to approximately 50 cm.
- Remove all the air by sliding your hand from the trailing edge to the leading edge.
- Make sure the volume is a little smaller than the protection bag.
- Avoid multiple folds at the same place.

### STEPS TO FOLD THE CANOPY

- 1 Open the canopy completely.
- 2 Packing the glider "accordion wise".
- 3 Place each profile reinforcement over the corresponding cell.
- 4 Bring together the two parts and roll the canopy up without compressing too strongly.

## CLEANING

Cleaning must be performed only when it is necessary. We recommend the use of water only with a smooth sponge or cloth. Do not use any chemical product, since it will damage the material permanently.

## PULLEYS

It is important you keep pulleys lubricated because in case they do not work may consume the speedy handle or axle, apply paraffin or lubricant spray, read carefully about the lubricant to avoid spots and fabric consume. Do not apply on the sewing lines.

## RIGID CONSTRUCTION

Various forms of plastic rods are used in the paraglider (rigid construction), which create the leading edge's shape and the canopy's stability. To ensure that the plastic rods keep their shape, it is important that you pack the glider as described in the section "Packing the paraglider".

The plastic rods on the TR 27 can all be replaced through small pockets. If you notice that a plastic rod has been damaged or misshapen because of incorrect use, this can be replaced by SOL Paragliders or a SOL Paragliders authorized workshop.

## LINE TRIMMING

The TR 27 is trimmed to give the highest possible level of performance and safety. The Vectran lines may shrink or stretch in normal use and particularly after hard shock-reinflations.

Pilots should check that the lines remain within tolerance. The TR 27 is certified with the lines trimmed so that the total line length from tab to riser is within 2cm of the values stated in the line-plan.

The lines must be measured with a load of 5kg, in order to ensure reproducible results for a comparison with the lengths in the check sheets.

Due to different measuring systems and calibration there is a possibility of a difference in the absolute line lengths. In this case, the measured values should first be corrected to the same base of the TR 27 check sheet data.

Correct line length and symmetry are important for performance, handling and have a considerable influence on flight behavior.

If the lines are more than 2cm out of tolerance they should be replaced. If the lines are less than 2cm out of tolerance they can be re-trimmed either by taking (or releasing) loops on the Maillons or by adding an extended Maillon. Contact your dealer or SOL Paragliders for details of how to retrim your glider.

### **Warning**

- When buying the lubricant make sure that this product does not attack the material properties. This may affect the fabric and lines resistance.

- Do not under any circumstances use knots to shorten the lines. Any knot will weaken the line considerably and may cause the line to break in case of high load. The overhand knot and bowline knots described are permitted only for connecting the main brake lines/brake handle.
- Lines age and lose strength even if the paraglider is used infrequently or not at all. This can affect the safety and function of your paraglider. Signs of wear are slight bumps or changes in flying characteristics. The lines must then be replaced immediately. Use only inspected and approved lines, which can be obtained through SOL Paragliders.
- A damaged line can result in loss of control of the glider. Always replace lines which are damaged.

## RECOMMENDATIONS FOR A LONG LIFE

- The TR 27 lines are made of Vectran. Individual line overloads beyond the normal range in flight must be avoided, because an excessive deformation of the line is irreversible, and becoming permanent. The same way, folding and creasing the lines must be avoided, specially the main lines. Never step over the lines or canopy, above all on hard surface.
- The canopy must be opened only on a clean surface area, since dirty can penetrate in the canopy's fiber, shorten the lines or spoiling the fabric. The lines must be kept from any entanglements on takeoff to prevent excessive deformation. Avoid storing the paraglider for long periods in areas with high humidity or heat, this causes premature aging of the materials. Keep away sand, stones or snow from entering the canopy cells because any weight on the trailing edge slows the canopy down, possibly creating a stall, furthermore, sharp corners may cut the fabric.
- During takeoffs and landings in windy conditions, a run-away canopy may hit the ground strongly and the shock may rupture the material.
- In case of line entanglement, the brake lines may peel-off or a main line may get cut by a brake line, due to friction.
- On landing, avoid letting the Leading-Edge fall forward and downward towards the ground because this may damage the materials that form the front of the paraglider and/or rip the sewn areas.
- The manipulation of the paraglider during ground takeoff, or a lot of wind speed up the aging process of your equipment.
- After a tree or water landing, the lines must be checked and tested. In case of salt-water contact, the paraglider must be soaked and washed with fresh water. Salt water might decrease the lines' resistance even if soaked with fresh water. The lines must be changed after contact with salt water.
- Never dry the paraglider directly under the sun. This must be done in a shaded area.
- After an accident send the paraglider for inspection to the manufacturer or distributor.

## **Warning**

- Your TR 27 was designed, tested and certified to perform the best. Any alteration of your paraglider will nullify your certification and jeopardize your safety. For these reasons we strongly recommend you avoid altering anything on your paraglider.

## **TR 27 - INSPECTION**

The first inspection check is mandatory completing 24 months or 100 flights, whichever comes first.

After the first inspection any wing must be checked yearly or at each 100 flights, whichever comes first. In any of these inspections may occur that a shorter period for the next inspection will be defined (f. ex. 6 months or 50 flights).

In case of excessive use (permanent spirals and other extreme maneuvers) the period of inspection must be shorter.

It is of utmost importance to follow these guidelines. Without performing the mandatory inspections, the paraglider loses its certification and the respective SOL Paragliders warranty becomes invalid.

Always check your equipment after an incident or in case the canopy has been stored for a long time. Repairs must be performed only by the manufacturer, distributor or authorized personnel. Minor repairs could be handled by yourself, although we recommend that repairs should be performed by the manufacturer or authorized personnel. They have the necessary materials and tools to maintain your glider. Replace materials only with the originals. Using any other the glider will lose his certification.

## **TR 27 - REPAIRS**

### **TEARS**

Along with your kit you get small adhesives for repair. Small tears up to 10 cm away from the line points may be fixed by you. Beyond that we advise you the maintenance be made by the manufacturer or by the registered workshop.

- Clean the spot where the adhesive will be applied with a humid cloth.
- It must be at least 2,5 cm more of the adhesive than the tear.
- Make the edges rounded to avoid to unglue after is glue.
- Apply on both sides of the tear.

### **LINE BREAKAGE**

Along with your kit you get a 1.1 thickness line to make a little repair. When you repair we advise you to sew the unsowed point after you check the measure. Do not knot because it may diminish up to 80 % of the line resistance.

## **SEALING**

Along with your kit you get sealing for the carabines. Do not leave your risers without them because they avoid the movement of the screw nut making it impossible their opening.

## **ZIPPER**

The backpack zipper must open and close softly. If there is any difficulty to move it you must apply paraffin or a spray lubricant to diminish the attrition among the components. You will notice the difference when you move it.

It is possible most of the times you fix by yourself the zipper. In case it does not close any more just pull it until the beginning of the position and with a pliers press both sides of the zipper.

## **Warning**

- We advise you the maintenance and repairs be made by the manufacturer or by a registered workshop.

## **TR 27 - WARRANTY**

Every paraglider manufactured has a Warranty of 3 Years or 300 Hours of Flight, whichever comes first.

### **WARRANTY TERMS**

- 1. This warranty is valid for all SOL Paragliders with LTF, EN or AFNOR certification, rated for leisure use only. The warranty includes defective materials and production errors.
- 2. This warranty does not include paragliders rated for professional use (school, competitions, aerobatics, etc). All paragliders used for competition or acro have a 1 year warrant for production errors.
- 3. This warranty is defined as repair or substitution of the defective paraglider parts determined by the producer.

### **WARRANTY PRE-REQUISITES**

1. A three-copied filled-out form: One copy to be sent to SOL Paragliders within 30 days after purchase; one copy to the sales person and one copy to the purchaser.
2. All flights must be logged providing information on date, place and length of flight.
3. The equipment must be kept in accordance with the instructions provided in this manual. All the storage, folding, cleaning and care instructions must be carefully taken.
4. Maintenance and inspections can only be performed by the manufacturer or authorized shop and must be properly documented.

5. The first inspection check is mandatory completing 24 months or 100 flights, whichever comes first. After the first inspection any wing must be checked yearly or at each 100 flights, whichever comes first. In any of these inspections may occur that a shorter period for the next inspection will be defined (f. ex. 6 months or 50 flights). It is of utmost importance to follow these guidelines. Without performing the mandatory inspections, the paraglider loses its certification and the respective SOL Paragliders warranty becomes invalid.

6. The owner pays all shipping and handling expenses.

7. The final decision on exchanging or repairing the equipment will be decided by SOL Paragliders. The corresponding equipment must be sent to SOL Paragliders in the following way:

- a) Accompanied by a copy of all inspections and a log of all flights.
- b) Accompanied by a copy of the SOL Paragliders warranty form.

### THIS WARRANTY DOES NOT COVER

- Any alterations on original fabric colors, lines and risers.
- Any damage caused by chemical products, sand, friction, cleaning products or salt water.
- Any damage caused because of errors during operation of the Paraglider, incidents or emergency situations.
- Any damage caused by inadequate operation of the Paraglider.
- Paragliders that may have been subjected of any alteration from the original design and without proper permission from SOL Paragliders.
- Damages caused by inappropriate transport, storage, or settings of the paraglider.
- Damages caused using not compatible components with the paraglider.
- Damages caused using inappropriate packaging for the transport.
- Paragliders without original identification label and serial number.
- Handling inadequately to the instructions given in the owner's manual.

### NATURE AND ENVIRONMENT

As much as safety, innovation and longevity, protection of the environment is a quality of SOL Paragliders. We believe that our clients are having the same environmental awareness. For this we like to remember:

Apart from self-evident things, like not leaving your rubbish behind, we would like to appeal for a thoughtful behavior towards animals, like birds of prey or game animals. If you notice, that your fly by affects those animals (like causing a shortening reaction) please increase your distance.

Our sport is an outdoor sport and we all are responsible for the health of our planet and it's environment.

Even the best paraglider is aging. Disused paragliders need a proper disposal. If you are not sure about the correct removal, please send your glider to SOL Paragliders or your flying school.

### FINAL WORDS

Safety is the major theme of our sport. To fly safely, pilots must train, study, practice and be alert to the dangers around us.

To achieve excellent safety levels, we must fly regularly as much as possible, don't go beyond our limitations and avoid exposing ourselves to unnecessary dangers. Learning to fly is a slow process and takes years, so don't pressure yourself. If conditions are not favorable, keep your equipment stored away.

Don't overestimate your skills and be honest with yourself. Every year we see many accidents which in most cases could be prevented with a minor adjustment.

We are a part of the community in which we live: friends, family and even people we don't necessarily know worry about us. Our obligation towards this community is to keep ourselves healthy and that at each landing we will be one landing happier than before. We fly so that we can feel more alive.

We wish you good and safe flights with your TR 27.



## TR27 - TECHNICAL DESCRIPTION

### USED TECHNOLOGIES

TR 27 combines our performance technology with security.



**PBP - Pressure Booster Profile:** New design to increase and maintain inner pressure. More performance along all velocity.



**X Battens:** Cross X battens strengthening the nose profile.



**3D Shaping:** Our double 3D Shaping is a three dimensions modeling technology that reduces wrinkles and imperfections on the leading edge construction, improving the overall aerodynamic performance.



**Mini Ribs:** Profiles between the cells of the trailing edge, which improve performance and handling.



**3RS - 3 Risers System:** A – B – C row in all levels- less 25% line consumption.



**BOW Tech:** Greater lift in the same sail area and better pressure distribution across wingspan glider.



**Full Hybrid Technology:** is the hybrid utilization of 2 types of fabrics and lines. An optimised combination of durability and resistance with low deformation and less weight.



**HPAR - High Project Aspect Ratio:** higher A/R in each class.



**HTM - High Tech Materials** – highest technology materials guarantee durability- Technora Lines, Diax Laminates, Inox Hardware, Polyester of High Tenacity.



**LCT - Laser Cut Technology:** Panels, profiles and parts cutting with Laser equipment.

## THE PROJECT

The TR 27 consists of 80 cells and has internal crossed diagonals applied at the profiles to distribute the weight uniformly. This maintains the canopy very shapely and cleans and reduces the induced drag.

The TR 27 was designed at the new software. Its enhanced design and profile are the result of our continuous development and refinement process in terms of performance paired with stability. The improved features of this project permit a large speed range and excellent stability.

### TECHNICAL DATA

	XS	S	M	L	XL	Unid.
Cells	80	80	80	80	80	
Projected Span	10,17	10,27	10,58	10,90	11,21	m
Projected Surface	19,34	19,75	20,97	22,24	23,54	m <sup>2</sup>
Projected A/R	5,34	5,34	5,34	5,34	5,34	
Real wingspan	12,51	12,64	13,029	13,42	13,80	m
Real Surface	22,49	22,95	24,38	25,85	27,36	m <sup>2</sup>
REAL A/R	6,96	6,96	6,96	6,96	6,96	
Line Diameter	0,6 - 0,9 - 1,0 - 1,2 - 1,4 - 1,6 - 2,2					mm
Height	776	783	805	828	850	cm
Maximum Profile	223	225	232	239	246	cm
Minimum Profile	44	44	45	47	48	cm
Weight	5,8	5,9	6,3	6,7	7,1	kg
Take off Weight	75-90	85-100	93-108	102-117	110-125	kg
Places	1	1	1	1	1	
Certification	CCC	CCC	CCC	CCC	CCC	

\* Take Off Weight: Pilot , Glider, Harness and equipment \*\* Performance depends on pilot position and aerodynamic form of the harness. The identification and information tag is found at the center of the wingtip.



## PARTS LIST AND MATERIAL

All components are high standar and were chosen for a long life of your equipment.

Top:	Tecido WTX 36 SI PU / Tecido WTX 29 SI PU
Bottom:	Tecido WTX 29 SI PU
Profiles/Diagonal Bands:	Tecido Perfil PRO-NYL 44 GR Tecido Perfil PRO-NYL 36 GR
Reinforcements:	Nylon Maxfio MEADA 1,6 / 2,0 / 2,5 mm
Front/Edges band:	Multiprint polyester 25 mm white
Attach Band (loops):	Fitanew 10 x 0.8 mm 140 kg
Thread for wing:	Guterman / Coats Poliester continuous filament 60 white
Thread for risers	Linhanyl / Coats Poliamide 20-30-40 Black
Karabiners:	Ansung Precision 15 mm Bl 800 kg
Risers:	Fitanew 15 x 2,0 mm flat multi Bl. 1.600 kg
Pulleys:	Nylon Sol 12 mm / ISR 16 mm ball bearing
Button:	Magnetic Italy 15 mm
Risers Clips:	SOL . Raeder

Lines:

Type of lines	12100 Vectran	12240 Vectran	16330 Vectran	12470 Vectran	16560 Vectran	16999 Vectran	PPSLS 260 Dyneema
Line producer	Cousin FR	Cousin FR	Cousin FR	Cousin FR	Cousin FR	Cousin FR	Liros GER
Number test of tenacity	LI 611.2018	LI 612.2018	LI 613.2018	LI 614.2018	LI 615.2018	LI 616.2018	LI 617.2018
Diameter	0,6 mm	0,9 mm	1,0 mm	1,2 mm	1,4 mm	2,2 mm	1,6 mm
Material	Vectran	Vectran	Vectran	Vectran	Vectran	Vectran	Dyneema
Material of the cover	No	No	No	No	No	No	Poliester
Tenacity	35,8 daN	96,2 daN	127,2 daN	186,6 daN	243,6 daN	432,5 daN	201,6 daN

## SUSPENSION SYSTEM

The TR 27 lines consist of Vectran with high resistance to tension and has low distortion rate. The set is made of individual lines, with sewn ties on both extremities.

The upper lines distinguish themselves (next to the inside layer) and the main lines, which are connected to the Quick Links. These, in turn connect to the main lines on the risers. The stabilizers' lines are connected to the same Quick Links.

The brake lines come out of the trailing edge, through the master line and are linked to the toggles, passing through a pulley attached to the 'B' riser.

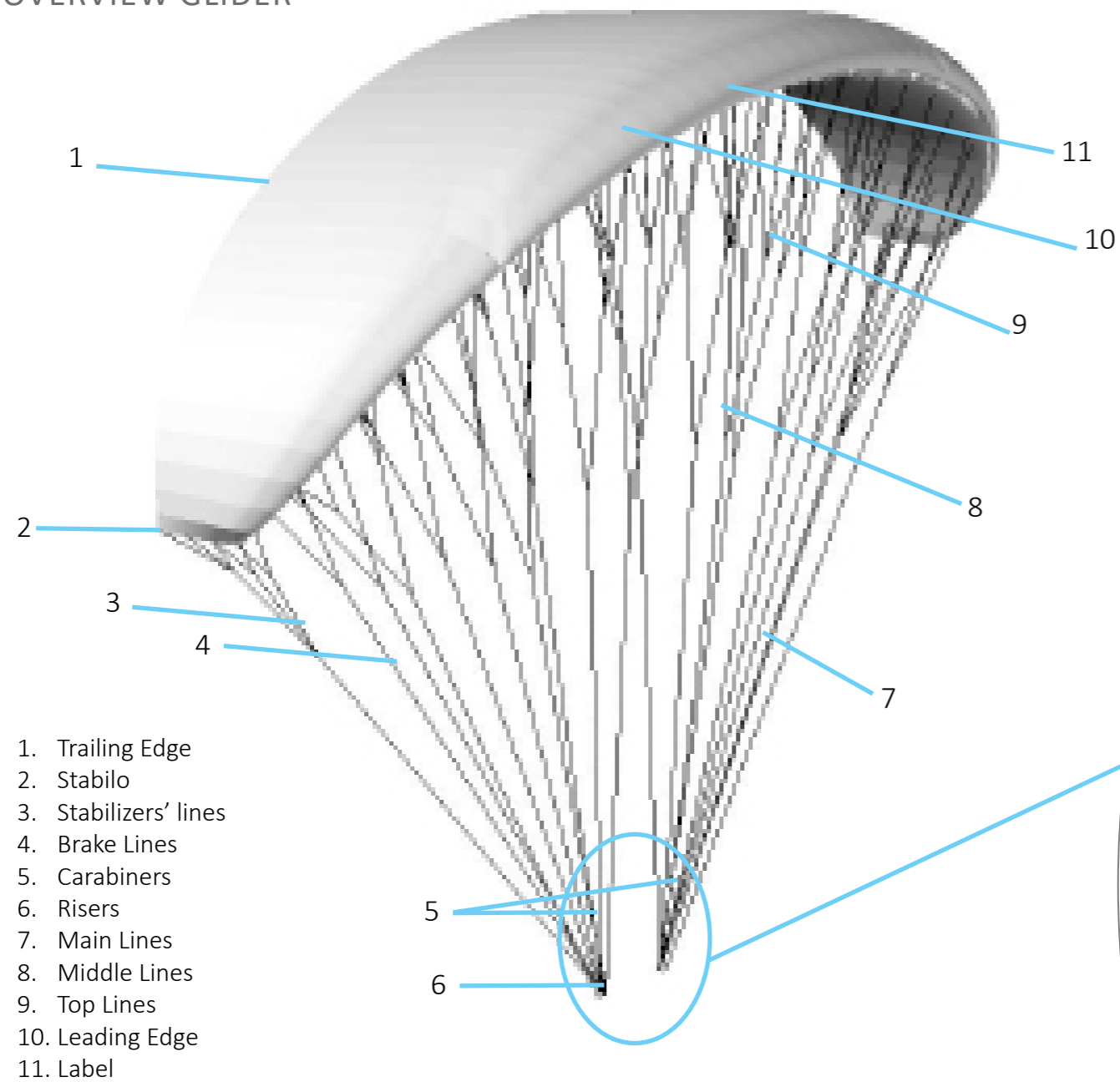
The brake lines are of different color in order to facilitate takeoff preparation.

The Quick Links are triangular shaped and are made of inox resin.

On the brakes' master lines, there is a mark at the ideal setting point, at which height the toggles are affixed. This setting should not be altered as it ensures adequate and sufficient path and room for the toggles in case of emergency situations during flight and landing. Furthermore, in this position the paraglider is not constantly on a stall.



## OVERVIEW GLIDER



The upper lines distinguish themselves (9), next to the inside layer, the middle lines (8) and the main lines (7), which are connected to the Quick Links (5). These, in turn connect to the main lines on the risers (6). The stabilizers' lines (3) are connected to the same Quick Links (5).

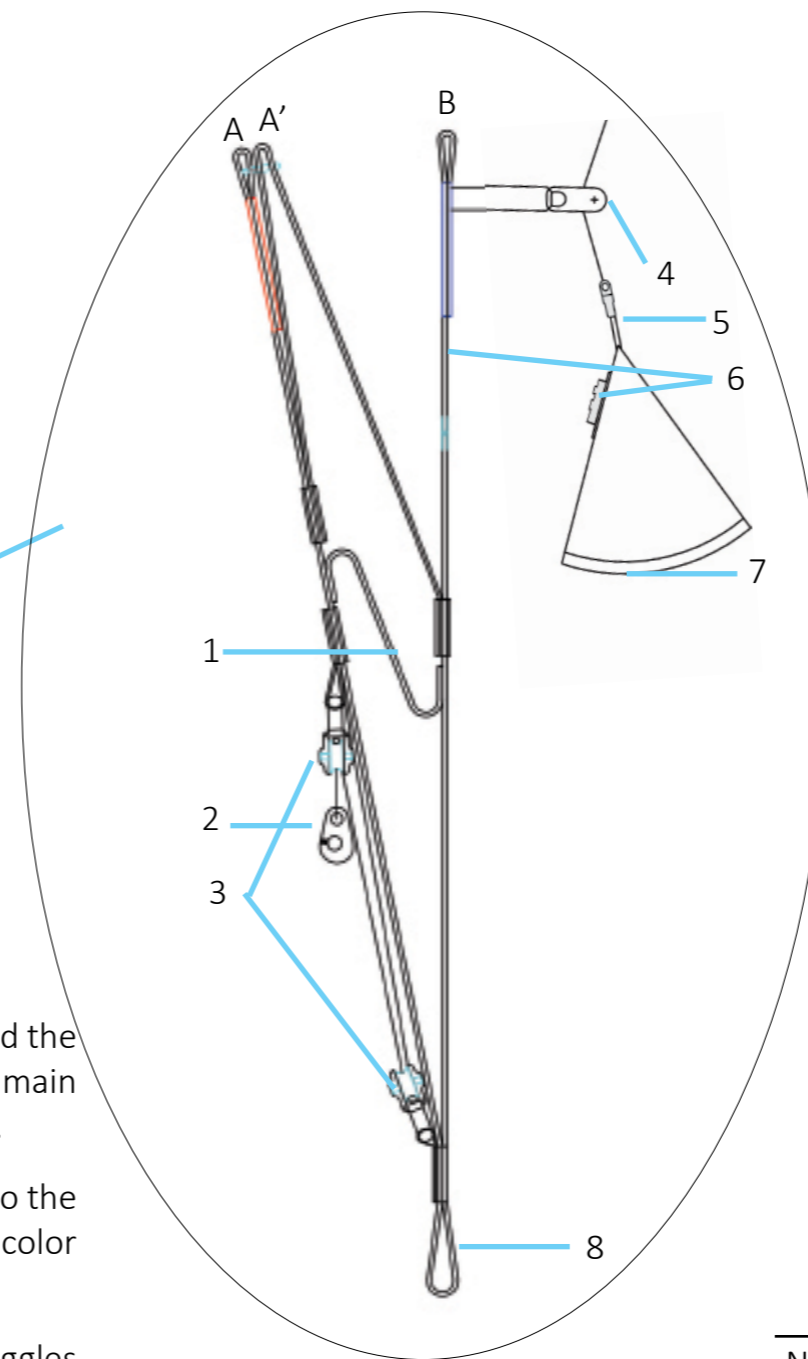
The brake lines (4) come out of the trailing edge, through the master line and are linked to the toggles, passing through a pulley attached to the B riser. The brake lines are of different color in order to facilitate takeoff preparation.

On the brakes' master lines, there is a mark at the ideal setting point, at which height the toggles are affixed. This setting should not be altered as it ensures adequate and sufficient path and room for the toggles in case of emergency situations during flight and landing. Furthermore, in this position the paraglider is not constantly on a stall.

## RISERS AND SPEED SYSTEM

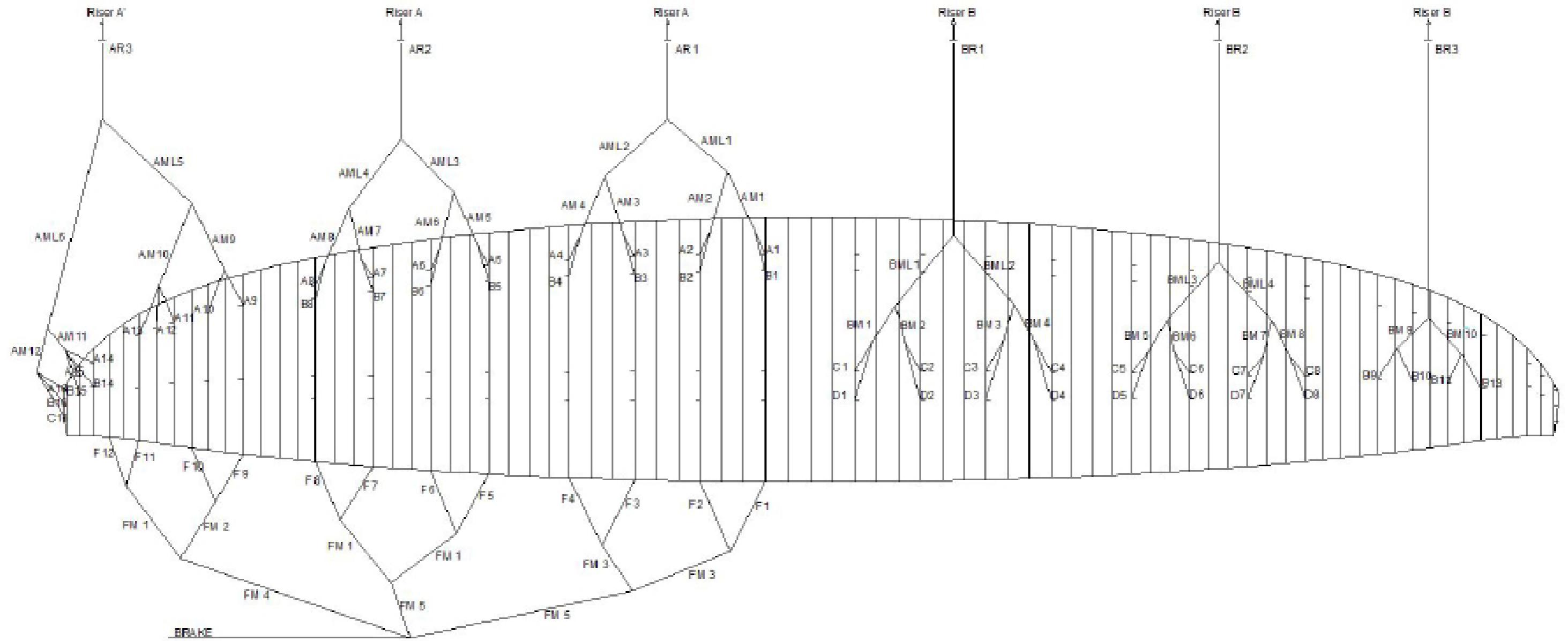
The TR 27 can be used with a speed bar. He has 2 risers on each side, with the A lines attached to the A riser. The riser A' is divided to make "ears" easy. The B lines and the stabilizer are attached to the B riser additionally, to the brake pulley.

The Speed System works on the risers A, A'. When set at the normal position, all risers have the same length. When the Speed System is activated, it shortens the risers A, A'. The riser B remains in its original position.



- 1- System of increase speed
- 2- Speed System Connection
- 3- Speed Pulleys
- 4- Brake pulley
- 5- Swivel
- 6- Magnetic button
- 7- Toggle
- 8- Carabiner's harness connection

	A	A1	B
Normal Position	550	550	550
Speed System Activated	420	485	



## LINE LENGTHS

## TR 27 - XS

	A	B	C	D
16	6374	6400	6466	
15	6382	6402		
14	6433	6420		
13	6519	6507		
12	6512			
11	6535	6532		
10	6586	6588		
9	6670	6669		
8	6805	6792	6791	6843
7	6808	6789	6791	6845
6	6860	6840	6842	6900
5	6967	6943	6946	7004
4	7045	7024	7027	7091
3	7027	7003	7008	7074
2	7068	7043	7048	7115
1	7166	7141	7146	7211

	F
12	7110
11	7095
10	7091
9	7144
8	7190
7	7191
6	7256
5	7387
4	7561
3	7669
2	7841
1	8073

Media not include risers  
with 5 daN of tension

## TR 27 - S

	A	B	C	D
16	6444	6470	6537	
15	6451	6472		
14	6503	6490		
13	6589	6580		
12	6582			
11	6606	6605		
10	6657	6661		
9	6741	6743		
8	6875	6864	6865	6917
7	6878	6861	6865	6920
6	6931	6913	6916	6975
5	7038	7016	7021	7079
4	7116	7098	7101	7166
3	7098	7076	7082	7148
2	7139	7116	7122	7189
1	7237	7215	7220	7286

	F
12	7182
11	7168
10	7165
9	7218
8	7265
7	7265
6	7331
5	7463
4	7638
3	7747
2	7920
1	8153

Media not include risers  
with 5 daN of tension

## TR 27 - XS

	A	B	C	D
16	6924	6950	7016	
15	6932	6952		
14	6983	6970		
13	7069	7057		
12	7062			
11	7085	7082		
10	7136	7138		
9	7220	7219		
8	7355	7342	7341	7393
7	7358	7339	7341	7395
6	7410	7390	7392	7450
5	7517	7493	7496	7554
4	7595	7574	7577	7641
3	7577	7553	7558	7624
2	7618	7593	7598	7665
1	7716	7691	7696	7761

	F
12	7110
11	7095
10	7091
9	7144
8	7190
7	7191
6	7256
5	7387
4	7561
3	7669
2	7841
1	8073

Media include risers  
with 5 daN of tension

## TR 27 - S

	A	B	C	D
16	6994	7020	7087	
15	7001	7022		
14	7053	7040		
13	7139	7130		
12	7132			
11	7156	7155		
10	7207	7211		
9	7291	7293		
8	7425	7414	7415	7467
7	7428	7411	7415	7470
6	7481	7463	7466	7525
5	7588	7566	7571	7629
4	7666	7648	7651	7716
3	7648	7626	7632	7698
2	7689	7666	7672	7739
1	7787	7765	7770	7836

	F
12	7182
11	7168
10	7165
9	7218
8	7265
7	7265
6	7331
5	7463
4	7638
3	7747
2	7920
1	8153

Media include risers  
with 5 daN of tension



## TR 27 - M

	A	B	C	D
16	6647	6674	6743	
15	6655	6676		
14	6708	6695		
13	6797	6788		
12	6790			
11	6814	6814		
10	6867	6872		
9	6953	6956		
8	7090	7080	7081	7135
7	7094	7076	7080	7138
6	7148	7129	7133	7194
5	7257	7235	7240	7300
4	7337	7318	7322	7389
3	7318	7295	7302	7371
2	7359	7336	7343	7412
1	7461	7438	7444	7512

	F
12	7398
11	7384
10	7382
9	7437
8	7486
7	7487
6	7554
5	7689
4	7869
3	7979
2	8156
1	8395

Media not include risers  
with 5 daN of tension

## TR 27 - M

	A	B	C	D
16	7197	7224	7293	
15	7205	7226		
14	7258	7245		
13	7347	7338		
12	7340			
11	7364	7364		
10	7417	7422		
9	7503	7506		
8	7640	7630	7631	7685
7	7644	7626	7630	7688
6	7698	7679	7683	7744
5	7807	7785	7790	7850
4	7887	7868	7872	7939
3	7868	7845	7852	7921
2	7909	7886	7893	7962
1	8011	7988	7994	8062

	F
12	7398
11	7384
10	7382
9	7437
8	7486
7	7487
6	7554
5	7689
4	7869
3	7979
2	8156
1	8395

Media include risers  
with 5 daN of tension

## TR 27 - L

	A	B	C	D
16	6851	6879	6949	
15	6859	6881		
14	6913	6900		
13	7005	6997		
12	6997			
11	7022	7023		
10	7076	7082		
9	7165	7168		
8	7306	7295	7297	7353
7	7309	7291	7296	7355
6	7364	7345	7350	7413
5	7477	7453	7460	7522
4	7558	7538	7544	7612
3	7538	7515	7522	7593
2	7580	7556	7564	7635
1	7684	7660	7667	7737

	F
12	7613
11	7599
10	7599
9	7656
8	7707
7	7708
6	7777
5	7915
4	8099
3	8211
2	8392
1	8635

Media not include risers  
with 5 daN of tension

## TR 27 - L

	A	B	C	D
16	7401	7429	7499	
15	7409	7431		
14	7463	7450		
13	7555	7547		
12	7547			
11	7572	7573		
10	7626	7632		
9	7715	7718		
8	7856	7845	7847	7903
7	7859	7841	7846	7905
6	7914	7895	7900	7963
5	8027	8003	8010	8072
4	8108	8088	8094	8162
3	8088	8065	8072	8143
2	8130	8106	8114	8185
1	8234	8210	8217	8287

	F
12	7613
11	7599
10	7599
9	7656
8	7707
7	7708
6	7777
5	7915
4	8099
3	8211
2	8392
1	8635

Media include risers  
with 5 daN of tension



TR 27 - XL

	A	B	C	D
16	7051	7080	7153	
15	7059	7082		
14	7115	7102		
13	7209	7203		
12	7202			
11	7227	7229		
10	7283	7290		
9	7374	7378		
8	7519	7508	7511	7568
7	7522	7503	7510	7571
6	7579	7559	7565	7629
5	7694	7670	7678	7742
4	7778	7758	7764	7835
3	7757	7733	7742	7815
2	7801	7776	7784	7858
1	7907	7883	7890	7963

TR 27 - XL

	A	B	C	D
16	7601	7630	7703	
15	7609	7632		
14	7665	7652		
13	7759	7753		
12	7752			
11	7777	7779		
10	7833	7840		
9	7924	7928		
8	8069	8058	8061	8118
7	8072	8053	8060	8121
6	8129	8109	8115	8179
5	8244	8220	8228	8292
4	8328	8308	8314	8385
3	8307	8283	8292	8365
2	8351	8326	8334	8408
1	8457	8433	8440	8513

	F
12	7826
11	7812
10	7813
9	7873
8	7926
7	7927
6	7998
5	8140
4	8328
3	8443
2	8628
1	8876

Media not include risers with 5 daN of tension

	F
12	7826
11	7812
10	7813
9	7873
8	7926
7	7927
6	7998
5	8140
4	8328
3	8443
2	8628
1	8876

Media include risers with 5 daN of tension

CCC CANOPY MEASUREMENT

XS - Canopy Measurement on Specimen (mm)

Scale Ratio	Span	12500						
<b>1,00000</b>	1/2 TE	6310						
Chord A	Rib 39	2262						
Chord B	Rib 22	2007						
	AR	6,93						
		<b>Chord</b>	<b>T. inlet</b>	<b>B. inlet</b>	<b>Tab A</b>	<b>Tab B</b>	<b>Tab C</b>	<b>Tab D</b>
	Rib 37	2250	2200	2165	1925	1785	945	700
	Rib 24	2056	2017	1986	1768	1644	873	647
	Rib 5	1080	1057	1057	895	458		

S - Canopy Measurement on Specimen (mm)

Scale Ratio	Span	12701						
<b>1,03158</b>	1/2 TE	6428						
Chord A	Rib 39	2280						
Chord B	Rib 22	2019						
	AR	6,93						
		<b>Chord</b>	<b>T. inlet</b>	<b>B. inlet</b>	<b>Tab A</b>	<b>Tab B</b>	<b>Tab C</b>	<b>Tab D</b>
	Rib 37	2261	2217	2181	1944	1803	959	711
	Rib 24	2067	2029	1997	1780	1652	881	655
	Rib 5	1092	1067	1067	904	464		

M - Canopy Measurement on Specimen (mm)

Scale Ratio	Span	13090						
<b>1,06316</b>	1/2 TE	6625						
Chord A	Rib 39	2350						
Chord B	Rib 22	2081						
	AR	6,93						
		<b>Chord</b>	<b>T. inlet</b>	<b>B. inlet</b>	<b>Tab A</b>	<b>Tab B</b>	<b>Tab C</b>	<b>Tab D</b>
	Rib 37	2330	2285	2248	2003	1858	988	733
	Rib 24	2130	2091	2058	1835	1703	908	675
	Rib 5	1125	1100	1100	932	478		



## L - Canopy Measurement on Specimen (mm)

Scale Ratio <b>1,09474</b>	Span 1/2 TE	<b>13479</b> 6822							
Chord A	Rib 39	2420							
Chord B	Rib 22	2143							
	AR	6,93							
		<b>Chord</b>	<b>T. inlet</b>	<b>B. inlet</b>	<b>Tab A</b>	<b>Tab B</b>	<b>Tab C</b>	<b>Tab D</b>	
	Rib 37	2399	2353	2315	2062	1913	1017	755	
	Rib 24	2193	2153	2119	1890	1754	935	695	
	Rib 5	1158	1133	1133	960	492			

The TR 27 was presented:  
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<http://www.A-I-R.de>  
 e mail info@a-i-r.de  
 Telefon: 0 8368 914 88 48 / Fax: 0 8368 914 88 49

## XL - Canopy Measurement on Specimen (mm)

Scale Ratio <b>1,12632</b>	Span 1/2 TE	<b>14010</b> 7070							
Chord A	Rib 39	2510							
Chord B	Rib 22	2230							
	AR	6,93							
		<b>Chord</b>	<b>T. inlet</b>	<b>B. inlet</b>	<b>Tab A</b>	<b>Tab B</b>	<b>Tab C</b>	<b>Tab D</b>	
	Rib 37	2473	2433	2395	2136	1985	1056	786	
	Rib 24	2268	2226	2180	1950	1810	963	718	
	Rib 5	1195	1170	1170	990	507			



## CCC LINE CALCULATION TR27 ALL SIZE

Name	Reference		Diameter mm	Break Value "New" (DaN)	Number of Lines	Break Value "New" (DaN)			
						Level 1	Level 2	Level 3	Level 4
A16	Cousin Vectran	12100	0,6	35,8	2				71,6
A15	Cousin Vectran	12100	0,6	35,8	2				71,6
A14	Cousin Vectran	12100	0,6	35,8	2				71,6
A13	Cousin Vectran	12240	0,9	96,2	2				192,4
A12	Cousin Vectran	12240	0,9	96,2	2				192,4
A11	Cousin Vectran	12240	0,9	96,2	2				192,4
A10	Cousin Vectran	12240	0,9	96,2	2				192,4
A9	Cousin Vectran	12240	0,9	96,2	2				192,4
A8	Cousin Vectran	12240	0,9	96,2	2				192,4
A7	Cousin Vectran	12240	0,9	96,2	2				192,4
A6	Cousin Vectran	12240	0,9	96,2	2				192,4
A5	Cousin Vectran	12240	0,9	96,2	2				192,4
A4	Cousin Vectran	12240	0,9	96,2	2				192,4
A3	Cousin Vectran	12240	0,9	96,2	2				192,4
A2	Cousin Vectran	12240	0,9	96,2	2				192,4
A1	Cousin Vectran	12240	0,9	96,2	2				192,4
B16	Cousin Vectran	12100	0,6	35,8	2				71,6
B15	Cousin Vectran	12100	0,6	35,8	2				71,6
B14	Cousin Vectran	12100	0,6	35,8	2				71,6
B13	Cousin Vectran	12240	0,9	96,2	2				192,4
B12	Cousin Vectran	12240	0,9	96,2	2				192,4
B11	Cousin Vectran	12240	0,9	96,2	2				192,4
B10	Cousin Vectran	12240	0,9	96,2	2				192,4
B9	Cousin Vectran	12240	0,9	96,2	2				192,4
B8	Cousin Vectran	12240	0,9	96,2	2				192,4
B7	Cousin Vectran	12240	0,9	96,2	2				192,4
B6	Cousin Vectran	12240	0,9	96,2	2				192,4
B5	Cousin Vectran	12240	0,9	96,2	2				192,4
B4	Cousin Vectran	12240	0,9	96,2	2				192,4
B3	Cousin Vectran	12240	0,9	96,2	2				192,4
B2	Cousin Vectran	12240	0,9	96,2	2				192,4
B1	Cousin Vectran	12240	0,9	96,2	2				192,4
AM12	Cousin Vectran	12100	0,6	35,8	2			71,6	
AM11	Cousin Vectran	12100	0,6	35,8	2			71,6	
AM10	Cousin Vectran	16330	1	127,2	2			254,4	
AM9	Cousin Vectran	16330	1	127,2	2			254,4	
AM8	Cousin Vectran	16330	1	127,2	2			254,4	
AM7	Cousin Vectran	16330	1	127,2	2			254,4	
AM6	Cousin Vectran	16330	1	127,2	2			254,4	
AM5	Cousin Vectran	16330	1	127,2	2			254,4	
AM4	Cousin Vectran	16330	1	127,2	2			254,4	
AM3	Cousin Vectran	16330	1	127,2	2			254,4	
AM2	Cousin Vectran	16330	1	127,2	2			254,4	
AM1	Cousin Vectran	16330	1	127,2	2			254,4	
AML6	Cousin Vectran	12240	0,9	96,2	2		192,4		
AML5	Cousin Vectran	16560	1,4	243,6	2		487,2		
AML4	Cousin Vectran	16560	1,4	243,6	2		487,2		
AML3	Cousin Vectran	16560	1,4	243,6	2		487,2		
AML2	Cousin Vectran	16560	1,4	243,6	2		487,2		
AML1	Cousin Vectran	16560	1,4	243,6	2		487,2		
AR3	Cousin Vectran	16560	1,4	243,6	2	487,2			
AR2	Cousin Vectran	16999	2,2	432,5	2	865			
AR1	Cousin Vectran	16999	2,2	432,5	2	865			
C16	Cousin Vectran	12100	0,6	35,8	2				71,6
C8	Cousin Vectran	12240	0,9	96,2	2				192,4
C7	Cousin Vectran	12240	0,9	96,2	2				192,4

Name	Reference		Diameter mm	Break Value "New" (DaN)	Number of Lines	Break Value "New" (DaN)			
						Level 1	Level 2	Level 3	Level 4
C6	Cousin Vectran	12240	0,9	96,2	2				192,4
C5	Cousin Vectran	12240	0,9	96,2	2				192,4
C4	Cousin Vectran	12240	0,9	96,2	2				192,4
C3	Cousin Vectran	12240	0,9	96,2	2				192,4
C2	Cousin Vectran	12240	0,9	96,2	2				192,4
C1	Cousin Vectran	12240	0,9	96,2	2				192,4
D8	Cousin Vectran	12100	0,6	35,8	2				71,6
D7	Cousin Vectran	12100	0,6	35,8	2				71,6
D6	Cousin Vectran	12100	0,6	35,8	2				71,6
D5	Cousin Vectran	12100	0,6	35,8	2				71,6
D4	Cousin Vectran	12100	0,6	35,8	2				71,6
D3	Cousin Vectran	12100	0,6	35,8	2				71,6
D2	Cousin Vectran	12100	0,6	35,8	2				71,6
D1	Cousin Vectran	12100	0,6	35,8	2				71,6
BM10	Cousin Vectran	12240	0,9	96,2	2		192,4	192,4	
BM9	Cousin Vectran	12240	0,9	96,2	2		192,4	192,4	
BM8	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM7	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM6	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM5	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM4	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM3	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM2	Cousin Vectran	12240	0,9	96,2	2			192,4	
BM1	Cousin Vectran	12240	0,9	96,2	2			192,4	
BLM4	Cousin Vectran	16330	1	127,2	2		254,4		
BLM3	Cousin Vectran	16330	1	127,2	2		254,4		
BLM2	Cousin Vectran	16330	1	127,2	2		254,4		
BLM1	Cousin Vectran	16330	1	127,2	2		254,4		
BR3	Cousin Vectran	12470	1,2	186,6	2	373,2			
BR2	Cousin Vectran	12470	1,2	186,6	2	373,2			
BR1	Cousin Vectran	12470	1,2	186,6	2	373,2			
						Total L1	Total L2	Total L3	Total L4
130 DaN maxi						3336,8	4030,8	4611,2	7423,2
						Nb G L1	Nb G L2	Nb G L3	Nb G L4
						25,67	31,01	35,47	57,10





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