

# Gradient Golden3

## Paramotor appendix



### INTRODUCTION

After using all sizes of the Golden3 for a whole season, the Gradient Team reached the conclusion that the wing is a very good first choice multipurpose glider. Thus we went for EAPR paramotor certification in sizes 24 and 26. This certification is equivalent to the former DULV certification.

If you plan to use the Golden3 for paramotoring, please read the following appendix carefully. If anything is not clear, or you have further questions, please don't hesitate to contact Gradient directly or your local dealer. We will be happy to help.

## MULTIPURPOSE RISERS AND THE TRIMMERS

If your paramotor has low hangpoints (that is, the distance from the seatboard to the main karabiners is similar to that of a freeflight harness) then you don't need to make any changes or adjustments to your Golden3 before using it for paramotor flight.

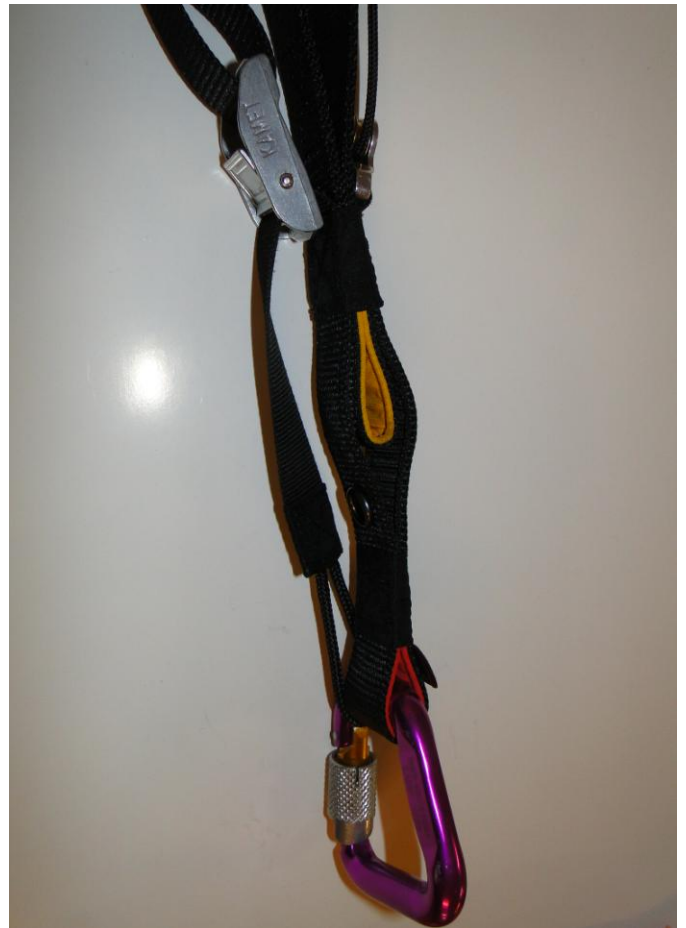
However, if your paramotor has high hangpoints then you will need to adjust the length of the brakelines. To make them longer increase both brakelines evenly, by a couple of centimeters at a time, until you reach a length that fits your set-up. If in doubt, ask a Gradient dealer to help.

For high hangpoint paramotors we also recommend using shorter paramotor risers, or special multipurpose risers with two different hangpoints. These make for easier takeoff and handling and, as an added advantage, also have trimmers (see Fig 1).

The multipurpose risers are designed for pilots who use their Golden3 for both paramotor and freeflight flying. Using these risers means you don't need to fit different risers for different kinds of flights. If you haven't seen them before, there are two different hangpoints. The lower, red hangpoint is for both freeflight and paramotor use. To maintain EN / LTF B certification of your glider in free flight you must hook the trimmers into the main karabiner and use these hangpoints (see Fig 2).



**Fig 1: Golden3 multipurpose risers**



**Fig 2: Hooking of the trimmers**

When using the Golden3 with high hangpoint paramotors use the higher, yellow, hangpoints. For maximum passive safety of the glider the trimmers can also be connected to the main karabiners. They will be completely locked when hooked in at the low attachment and limited in their range when hooked to the high attachments. This option may be useful for teaching.

For paramotor certification the Golden3 was tested with both open and closed trimmers plus speedbar. The trimmers extend your speed range by some km/h, and with an asymmetric setting can compensate for the turn caused by the engine's torque. You can compensate for the torque of a clockwise turning propeller by opening the left-hand trimmer slightly more and vice versa.

Although the Golden3 was tested for paramotor use with open trimmers plus speedbar (maximum speed) it is not recommended. We recommend using trimmers **or** speedbar, or trimmers plus a little amount of speedbar. When flying with speedbar or open trimmers always bear in mind that your glider becomes more prone to frontal or asymmetric collapses and the reactions are definitely more demanding.

We have kept the range of the trimmers at a level suitable for average pilots. With trimmers fully open brake length is longer, the forces are bigger and thus handling decreases. It may be possible to take off, fly and land with the trimmers fully open, but we only recommend using fully opened trimmers for cruising flight at a safe altitude.

**Fig 3: Length of the Golden3 multipurpose risers (mm)**

<b>Golden3 - free flight</b>	Size 24			Size 26		
<b>Bottom hooking point (red)</b>	A <sub>1</sub> + A <sub>2</sub>	B	C	A <sub>1</sub> + A <sub>2</sub>	B	C
Non-accelerated (trimmers locked)	460	460	460	480	480	480
Accelerated by speedbar	385	405	460	400	424	480

<b>Golden3 - powered flight</b>	Size 24			Size 26		
<b>Bottom hooking point (red)</b>	A <sub>1</sub> + A <sub>2</sub>	B	C	A <sub>1</sub> + A <sub>2</sub>	B	C
Non-accelerated (trimmers closed)	460	460	460	480	480	480
Accelerated by speedbar	385	405	460	400	424	480
Trimmers open	460	474	496	480	496	522
Trimmers open plus speedbar	385	420	496	400	440	522
<b>Upper hooking point (yellow)</b>	A <sub>1</sub> + A <sub>2</sub>	B	C	A <sub>1</sub> + A <sub>2</sub>	B	C
Non-accelerated (trimmers closed)	365	365	365	380	380	380
Accelerated by speedbar	290	310	365	300	324	380
Trimmers open	365	379	401	380	396	422
Trimmers open plus speedbar	290	325	401	300	340	422

## **EXTENDED WEIGHT RANGE**

The Golden3 was tested for paramotor flight with an extended weight range. This makes sense, as you will free-fly and paramotor with the same wing, and paramotor equipment usually weighs 20 kg to 30kg more than free-flying equipment.

Pilots usually choose to fly with a higher wing loading on paramotors because sink rate becomes less important – it can be compensated for with engine power. However, handling and cruising speed increase.

Pilots who mainly want to use a paramotor to get up and go thermal flying may want to choose a bigger size, so they get similar wing loading as in free flight.

And pilots who want to do fast XC flights and have the necessary skills may even chose a smaller size. However, as always, advantages don't come free. Smaller wings with a higher wing loading are easy to handle even in strong winds, fly fast, have nice direct and sporty handling and are very resistant against collapses caused by mild turbulence.

But the more you load your wing, the more speed you will need for takeoff and landing. Flared landings must be well timed and although collapses and other incidents are more unlikely to happen, if they do they will be much more demanding. Spiral dives and all other intended manoeuvres become more demanding, faster, build up more energy and need sensitive inputs.

## **GENERAL ADVICE**

While paramotoring there is no reason to expose yourself to any danger caused by thermal turbulence or strong wind, as you don't need these to stay in the air on your paramotor. Thus we recommend to all, especially to less experienced pilots, to fly in the calm morning and evening hours and on low wind days only. Remember that close to the ground strong winds always cause strong turbulence. An exception to this is at coastal soaring spots.

We strongly advise against simulating any flight incidents as though on a free flight SIV course. Because of the high mass inertia and wingloading in paramotoring, the risk of having an incident when executing any extreme manoeuvre is much higher than when free flying. Riser twists are more likely to occur, and coming down under a reserve parachute will likely damage your machine, and, if unlucky, yourself. Remember, paramotor harnesses do not usually have back protection like free flight harnesses do.

Over the next few pages we explain the main differences in the standard manoeuvres when performed on a paramotor. Many of these explanations are valid for any paramotor glider and are not specific to the Golden3. However, this manual is not a 'How-to' paramotoring guide and even for experienced free-flight pilots proper instruction is mandatory.

## **TAKE OFF**

It is at take off where you will find the biggest difference between free flight and paramotor flight. Because you inflate on the flat the glider will need more time to inflate and rise above your head. You should avoid leaning forward with your body when adding engine power, because the thrust from the engine will push you downwards instead of forward. Try to stay as upright as possible and let the engine help to accelerate your body.

Because of the higher speed needed to create sufficient lift with the higher loaded wings, we advise the following takeoff technique:

- Inflate your glider using either a forward or reverse launch technique. Due to the Golden3's good take off behaviour it is not necessary to add any engine thrust, even in nil-wind conditions.
- Once the glider is stabilised and centred above you, progressively add engine power and accelerate.
- Stay in an upright position and add only as little brake as necessary to control the glider. Brake pressure is quite low in this range on Golden3. Don't brake too much as this will hinder your acceleration.
- Once you have accelerated enough and you start to feel the glider lift, you can help the glider to pull you off the ground by applying some brake.
- For an easier climb and for added brake pressure, slightly open the trimmers.
- Never try to take off in turbulent areas or in tailwind. This will be even less promising than in free flight! Make sure that your flight path is free of obstacles and stay focused until you are at a safe altitude. During take off, never release the brake handle that you need to apply to compensate for the engine's torque.

## **SAFETY**

From take off to landing always keep in mind that your engine may fail.

Paramotor engines are not built like aeroplane engines. They have no malfunction or safety backup. Consequently, you should always fly with a safe landing within glide.

Always be cautious when estimating what this is. Consider the worst glide possible, taking into account the drag of a non working engine compared to what you are used to while free flying.

Usually the climb rate on a paramotor on full throttle is less than the sink rate on a failed engine. That means climbing over unlandable terrain without a safety margin of already attained altitude is not sensible – if the power cuts out, then you may not be able to glide out.

Never climb across powerlines or other obstacles. A sudden loss of thrust also means a sudden loss of altitude due to the surge of your glider.

Never fly over open water without enough height for a safe glide to shore. Most fatal paramotor accidents occur from drowning.

## **CLIMBING AND CRUISING FLIGHT**

Your Golden3 climbs well in any trimmer configuration. Pushing lots of speedbar will mean the climb rate starts to slow. Never apply too much brake during your climb. The climb rate won't increase but the risk of parachutal or stall increases.

In general, depending on the thrust and design of your engine, steering travel and handling of a glider decreases while climbing. The effect of this is quite low with the Golden3 and the glider maintains good manoeuvrability under the engine's thrust. Nevertheless, we recommend reducing throttle when entering quick turns.

Engine thrust stabilises your glider during a climb or while cruising. But if you enter strong turbulence you should reduce engine power as the risk of collapses increases with increased turbulence. This risk can be reduced through active flying.

However, the gyroscopic stability of a fast turning propeller makes it almost impossible to follow any quick turns of your glider and thus increases the danger of riser twists. Always try to apply or release throttle with the right timing to avoid additional pitch or roll of your glider.

## **LANDING**

With its good glide ratio and low sink rate you can land your Golden3 easily and softly without applying any engine power. We recommend switching off the engine on your final approach, once you know you will get to where you want to land.

Keep in mind that the hot exhaust of your motor can burn the fabric and lines of your glider. In calm air it is best to let the glider fly on trim speed until your legs nearly touch the ground. This way you keep enough energy for a nice flared landing.

Close to the ground you transfer the energy of the glider into horizontal flight by a hard but short brake input. Once you notice that the energy is fading and you cannot keep level flight, pull both brakes completely with the remaining travel.

With the right timing this method makes for very nice landings especially in nil-wind conditions. However, if you brake too much too early and the glider starts to climb, let it climb but keep control of the brakes and don't let the glider surge forward. Prepare for a harder landing.

If the glider descends very quickly through the last few metres of the air because of a fading headwind and you do not feel a lot of brake pressure, you must brake the glider earlier. The more energy, speed and brake pressure you have, the more lightly you should apply your brakes to avoid an excessive climb.

## FAST DESCENT TECHNIQUES

With an idling or turned-off engine the sink rate should be enough to descend quickly enough. It will be 2-3 m/s, depending on the engine and wing loading. On a paramotor you wouldn't usually fly in thermal conditions that make fast descent techniques necessary, unless you are a very experienced pilot and familiar with these options. In general though you can perform all common fast descent techniques as described in the main manual.

**Big Ears:** This manoeuvre works as described in the main manual. Sink rate may be slightly higher. Manoeuvrability by weight shifting may be restricted, depending on the motor system.

**B-Line Stall:** This manoeuvre works well with the higher wing loading of a paramotor. Forces for entering B-stall are a little higher because of the higher load – you have to pull harder. The glider rocks back more on entry and surges forward more on exit. When exiting B-stall don't apply any brake until the glider has returned to normal flight.

**Spiral Dive:** Because of the high wing loading it is very easy to enter a spiral dive with a paramotor on the Golden3. Pay attention to how much brake you apply on entry. As soon as the glider enters the spiral, do not apply much more inside brake but instead regulate the spiral and the descent rate with the outside brake.

You gain a lot of energy during a spiral dive. Take care on exit to bleed this energy off gradually. Apply more outside brake to initiate the exit, but keep the glider in some steeply banked turns with some inside brake to reduce the energy. Never try to bring back a glider which has already started to climb out of the spiral dive into these fading turns.

If the glider starts to climb out of the spiral too fast, just let it go. Try to centre yourself, keep your hands up and brake the glider only if it surges really far after the big climb.

Because of the high wing loading and the extra drag caused by the frame and propeller all paramotors have a stronger tendency to stay in a stable spiral dive. This means you should only perform a spiral dive on your paramotor if you really know how to do it. Always keep the glider at moderate sink rates.

## INCIDENTS

Generally the same rules as in free flight are valid. Please refer to the main manual.

**Asymmetric collapses:** In case you get an asymmetric collapse on your Golden3, just keep it on course with some brake input on the open side. Release the speedbar if you have it on. With open trimmers the necessary brake pressure may feel unusually high. It is very unlikely that you will get a collapse with power on, but if it happens reduce the thrust gradually to idle and concentrate on the normal collapse procedure.

**Frontal collapses:** Your Golden3 will exit frontal collapses by itself. As the glider is in a kind of parachuted after frontal collapses for a short time, it is important to release the brakes completely and let the glider gain speed again. In case of massive frontal collapses, asymmetric opening or delayed opening you may help the glider by a strong but short brake input. But be sure not to stay on the brakes for a long time.

**Stalls and spins:** These manoeuvres will not happen on your Golden3 unless you initiate them. Because of the Golden3's good handling, it is very unlikely that you will spin the glider instead of entering a proper turn. Even with power there is a brake range of at least 40cm remaining, so you will never stall your glider by accident, so long as you fly in the right conditions.

Don't do any deliberate stalls or spins with your motorised paraglider. Even if you are confident with these manoeuvres in free flight, they are far more demanding and dangerous on your paramotor due to the high wing loading and the big mass inertia.

In case you feel a decrease in the brake pressure, especially during climbs, release the brakes immediately and reduce the throttle. In a fully developed spin or stall it is important to release the brakes at the right time, as described in the general manual.

Always consider the reduced brake travel while climbing, learn to apply the right amount of power at the right time and take care not to apply lots of outside brake in turns, particularly when turning against the engine's torque.

## **INSTRUCTION AND LOCAL LAWS**

As a young sport paramotoring is not evenly regulated across different countries. Check with your local paragliding or paramotoring national associations. In some countries the complete device – the wing and the paramotor unit – has to be tested for compatibility.

Remember, even experienced paraglider pilots must undergo training to safely learn how to paramotor.

## **INSPECTION INTERVALS**

Because of the higher load and engine vibration the main lines of your Golden3 may age faster than in free flight. Further, the minimum strength required is higher because of the higher take-off weight. Therefore the main lines of all Golden3s used for paramotor flights have to be inspected every 100 flying hours. A complete inspection of the glider is necessary after 24 months as usual. Please note your paramotor hours carefully and contact your Gradient distributor for a line inspection. Please advise your service centre about the paramotor use of your glider.

**Finally, we wish you many pleasant, safe and enjoyable flights with your Golden3!**