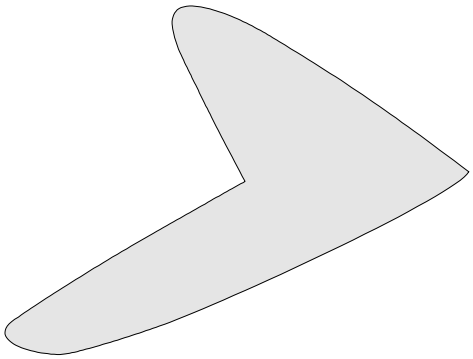
Laminar MR/MRx

Instructions Manual



® Laminar

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A Drawings (including spares names and codes)
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II. ICARO Made in Europe

Congratulations on buying an Icaro 2000 hang glider! We're certain that you've made the right choice.

Icaro 2000 srl is Europe's leading hang glider manufacturer, constructing hang gliders for almost 20 years, and selling over 7,000 gliders all over the world in the last decade. Icaro 2000's competition and sales record are the envy of other manufacturers.

Icaro 2000 gliders are fully designed and manufactured in our factory at Sangiano –Northern Italy, using only first quality materials. All our hang gliders have German certification (DHV).

With our extensive, worldwide distributors network, you can rest assured that spare parts and service will always be available to you no matter where you fly. This includes spares for all current and dated models.

Thank you for choosing our hang gliders and we wish you all great flights!

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III. Preface

The development of the **Laminar MR/MRx** brings you an easy-to-fly glider with better performance and safety standards.
In the trailing edge of the MR/MRx, for the first time, the horizontal carbon rod supports 5 battens, and both Swivels are equipped with a compensator function. This does not only mean getting great values on the certification tests, but also a significant enhancement of passive safety.

IV. Introduction

Over the last decade hang gliding has become much safer.
Accidents have been few, due to flight-schools becoming more professional, and certification procedures becoming more demanding. In Switzerland, for example, the insurance risk of hang gliding is the same as of winter sports.

However, hang gliding is an active sport with all the associated risks. Your safety can be greatly enhanced by following a few simple rules:

A. Keep risks to a minimum

1. Attend a professional school.
2. Fly a glider suited to your ability.
3. Only fly when weather conditions are appropriate.
4. Remain current. Try to avoid long intervals between one flight and the next so your flying ability will gradually increase.
5. Be aware of when it's better not to fly: caution is a mark of intelligence not of cowardice.

There is inherent risk whenever you change gliders.
In order to minimize this risk, gradually become familiar with your new glider following some basic rules:

B. Learn by yourself

1. Study your manual. Practice setting up and breaking down your glider as explained in the manual.
2. **Always use a system for assembly and preflight.** Don't let yourself be distracted from your setup or your preflight.

C. Assembly check and first flight.

- Every authorized ICARO 2000 dealer must test fly your glider before delivery. Be certain that it has been done !

- Your dealer should also help you set up your glider for the first time and assist you on your first flight.
- We strongly recommend wheels on your speedbar: this is absolutely essential for first flights.

D. High flights.

- Always wait for ideal weather conditions for your first high flight.
- Experiment with different vg settings, roll reversals, slow flight, high speed flight, and stalls at an altitude of at least 150 m ~ 500 feet.
- Fly your personal polar with your instruments.

V. Fundamental Rules

1. After major repairs, after remounting the sail, or after a long period of not flying, always **fly from a site** where it is possible to land immediately after take-off.
2. Do not change anything on your glider, and periodically check the trimming values shown in the table.
3. Only fly after having attended a good school, recognized by your hang gliding federation.
4. The owner's manual does not replace the check done by an authorized dealer. *This applies also to expert pilots*.
5. Never fly alone.
6. Before every take-off always do both an assembly check and a pre-flight check.
7. Only fly in places suited to hang gliding: it's your duty to know the limits of your glider.

VI. Glider Classification and General Restrictions

A. Glider Classification

Laminar MR 13 & 14	**DHV-3**

B. *Wind speed*

When the wind speed is over 30 km/h (~ 15 mph) take off becomes risky. When the wind increases, if you are not sure of your judgement, consult a more experienced pilot before taking off.

If in doubt, don't fly.

C. *Turbulence*

Foreseeable negative loads in flight must be avoided!
Do not fly in strong lee-side conditions!

D. *Aerobatics*

Aerobatics can be fatal. They are prohibited by every federation.

As aerobatics it is intended flying bank angles in exceeding 60 degrees, pitch angles beyond of 30 degrees, whipstalls, wingovers, loops, and spins.

VII. Recommendations

A. *Winch and UL- Towing*

Our hang gliders have been tested, according to the DHV guidelines, for winch and UL- towing.

B. *Transport*

Most damages on hang gliders happen during transport, either on the car roof or on cable cars.

In order to prevent damages during transport, the roof racks must have a proper padding; it is important to have a proper support for the glider in the front too.
It is possible to mount special racks for hang gliders on your roof racks. With these special racks, your glider transport will be most favorable.

To avoid damages when riding with a cable car, we suggest you are always present when the glider is loaded and unloaded.

C. Motorization

Extensive testing and certification procedures are necessary for hang glider motorization with the different systems. You must contact a specialized dealer.

VIII. Assembly

There are two possibilities to assemble your LAMINAR MR/MRx properly.

The glider should be assembled on the A-frame.
This method helps you protect your glider in an excellent manner because the sail practically never touches the ground.
This avoids scratches or dirt on your sail.

It is also possible to assemble the glider on the ground (flat assembly). This method is only recommended when setting up in strong wind conditions.

Left and right in this section must be taken as in flight position.

A. Assembly on the A-frame

1. Open your glider bag and remove all the Velcro straps. Mount the speedbar and secure it with the safety pins.
2. Now turn the glider around, stand it on the A-frame and attach the front-rear cable.
3. The next step is to attach the big "dive sticks“(swivels).
4. Open the wings and tension the glider attaching the metal plate to the bolt on the keel. In little wind you may use the rear end of the keel as a support (push the spring button and pull out the keel end) to set up more comfortably.
5. Remove the protection bags from the wing end and insert the fiberglass tip until you hear them hit the wing ends (“clack“), then tension them with the levers.
6. Insert the small carbon support rod in its pocket (you reach it by opening the fiberglass tip zipper) and secure it with the Velcro strap.
7. Starting at the center, insert and secure the curve battens (green go left). Insert and secure the straight battens.

Repeat steps 5-7 on the other wing.

8. Pass the VG cord through the clam-cleat on the speedbar and pull the VG on, a little.
9. Position the swivels properly and close the zipper. Make sure that the swivel cable runs parallel to it and it is not tangled.

Repeat step 9 on the other wing.

10. Make sure the hang loop is in the proper position (you may need to turn it around) and close the central zipper.
11. Put the nose protection on.

You must carefully check your glider after you are done setting it up!

***Note*: To disassemble your glider, follow the Assembly instructions in the reverse order.**

IX. Short Packing

To short pack your glider (4.15m~13'7") it is important to follow these instructions:

1. Undo the sail fastening on the end of the leading edge tube.
2. Remove the compensator cable attached to the swivel lever.
3. Press the spring button on the rear leading edge and remove it. On the MR14 it is 120cm~3'11" from the tube's end and on the MR13 95cm~3'1".
4. Make sure not to wrinkle the Mylar leading edge insert too much when you fold the sail; you may also take it out.

Repeat steps 1-4 on the other wing.

X. Check Points

Before every flight it's mandatory to do a systematic check of the glider.

A. Assembly Check

The best way to check assembly is to begin from the nose of the glider, go counter-clockwise around the glider through all listed locations, and finish by checking the center and the control frame.

The following points have to be checked carefully:

1. **Nose**
   - The nose catch push-pin is attached. The end of the push pin is secured.
   - The nose fairing is well fitted .
2. **Crossbar-Leading Edge Left joint**
   - The nut bolt which attaches the crossbar is secured.
   - Side wires in perfect conditions
   - Carbon crossbar is not damaged
3. **Left Wing Tip**
   - The two nut bolts on the leading edge are secured.
   - The integrated tip wand lever tensions the sail, and the sail zipper is closed.
   - The end of the sail is flat.
   - The floating tip is correctly inserted in the end of the leading edge, and the zipper is closed.

- The swivel is mounted and secured by its string. The zipper is closed
- The Leading Edge tube isn't damaged

4. **Left Wing Battens**
   - All the upper battens are fixed with a double purchase to the bungee.
   - Lower battens are in place and secured.
5. **Rear Keel**
   - The bolt and the plate of the crossbar pullback are well-fixed and secured by the spring pin.
   - The bolt which crosses the keel securing the rear wires is secured by the nut.
   - The lower wires are in perfect conditions

6. **Right Wing Battens**
   - see above point 4.
7. **Right Wing Tip**
   - see above point 3.
8. **Crossbar-Leading Edge Right joint**
   - see above point 2.
9. **Central Slide Block**
   - The Slide Block is tightened in its position by the black belt
   - The spring catch which holds the crossbar secured is attached.
   - The zipper is finally closed
10. **Control Frame - Upper Side**
    - The hanging bolt is not bended
    - All bolts are tightened
    - The seesaw connection is perpendicular to the keel
    - The hang strap is not damaged and well secured
11. **Control Frame - Lower Corners**
    - The speedbar is well-fixed: the push-pins are in place, the two socket head bolts which close the speedbar into the base bar and the lateral wires are inside the nylon block and do not protrude.

B. Symmetry

Pull the VG-on (full) and stand behind the glider holding the keel up. Control the glider's symmetry, check that the twist on both wings is identical.
The twist must increase outwards, on both sides.

C. Harness & Rescue Parachute

1. **Height of the harness from the bar**
   - When doing the harness check, if you have a curved speedbar you must consider that while you are loading the glider with your weight, the speedbar bends, thereby straightening the curve, (the maximum displacement could be roughly 5 cm. (~ 2 inches).
   - If you therefore do a harness check of this type, allow the hang strap to be about 5 cm (~2 inches) long: this way you will hang the appropriate 5~8cm (2~3 inches) above the bar in flight.

2. **Rescue parachute**
   - It is in place

D. Pre-flight check

1. Hooked in
2. Strength and direction of the wind checked
3. Angle of nose correct
4. Wings leveled
5. Take-off area free

XI. Some Take Off, Flying and Landing Tips

A. Variable Geometry

The Laminar is fitted with a very effective variable geometry (VG).
Pulling on the VG cord located on the bottom of the control bar moves the crossbar backwards, thereby increasing the nose angle and tightening the sail.
Pulling in on the variable geometry improves the sink rate and the efficiency.
Variable geometry

ON	completely pulled IN
OFF	completely let OUT

B. Take Off

You can pull the VG somewhat on about 50cm (~20 inches) for take off so that the lower wires are not too loose. This will make ground handling easier. Basically: with the VG-off, the twist is quite big, which means the glider has a good takeoff behavior (hard to stall). Only when there are strong thermals at the takeoff area, is it preferable to let the variable geometry completely off.
On the other hand, you could take off with full VG in zero wind (i.e. gliding contests, Speed Gliding…etc.), in this case, the nose angle must be decreased. With a shallower twist and a high nose angle, in a somewhat flat launch area, you could stall and/or blow your take off.

Although the launch characteristics of the Laminar are forgiving enough that you can get away with minor errors when taking off, such as nose angle a little too high or takeoff speed a little slow, always keep the nose down and run hard.
If your glider has been rained on while set up, towel it dry before taking off. A wet sail will stall at higher speeds, making take off and landing substantially more difficult.

Important: Do not take off with a wet sail !!

C. Flight

The MR/MRx has a long VG path. With the VG full off, the roll reaction time is the lowest. In strong and narrow thermals where quick glider response, as well as a good steep turns behavior is needed, this is the proper VG position.
In regular thermals you should pull the VG-on a little. This will increase your climb performance.
With the VG full on, the performance is the highest as well as the roll reaction time. In turbulent conditions or close to a slope it is and advantage to pull off the VG somewhat, approx. half or ? of the VG path.

D. Landing

The stall behavior is optimal with less twist (more VG). With a little VG-on (approx. ?) you have a good compromise between good roll reaction time and good stall behavior.

- Approach the landing field with a medium-high speed.
- When you are near the ground slow down, then keep flying parallel to the ground, gradually easing out the bar.
- Keep a light touch on the downtubes, holding them as high as possible for maximum flare authority.
- At the right moment, flare and land on your feet.

XII. Trim

A. Speed

With the VG slightly on (20-30 cm/7.9-11.8 inches) the speed should be just above minimum speed, with your hands in a neutral position on the speedbar (approx. 4-5 km/h / 2.5-3.1 m.p.h. above stall speed).
When you move your hang loop position forwards, the glider will be trimmed faster and moving it backwards results on a slower trim.
Attention: with a glider trimmed too slowly it will have poor roll maneuverability as well as poor turn behavior in slow thermal flying (glider tends to fall into the turn).

B. Turns:

First of all you must know if your glider has a turn with the VG-on or VG-off.

Turn with the VG–off: It is possible to correct it by adjusting the fiberglass tip. For instance, if the glider has a right turn it means that either the left fiberglass tip must be raised or the left one lowered.
This is achieved by rotating the leading edge tube end cap (with the eccentric hole). You have to remove the nut, which secures the sail and, at the same time, gives the deflection and secures the fiberglass tip.
Unscrew the small safety screw on the end cap. Remove the aluminum tube, and then take the end cap out using a screwdriver. By turning this eccentric cap you will adjust the fiberglass tip's height. The hole upwards means a higher position.

You may test fly the glider without the small safety screw due to the high adhesion of the end cap. Once you have found the proper position, you should drill a small hole in order to secure the end cap with the screw again. You must replace the safety screw.
Another possibility is to modify the batten profile on the outer wing of the turning side (increase the curve on the last 3 battens – nr. 9, 10, 11– approx. 1cm/0.39“).

Turn with the VG–on: When the Laminar has a turn with the VG-on, you must check the symmetry. The swivels work even in slow flight, if they are not equally positioned the glider will not fly straight. For instance, if your glider turns to the right, the right swivel is too high or the left one too low.
If the bar pressure is strong at high speeds, full VG-on (80 km/h / 50 m.p.h. and up), in a glider with a right turn, the right swivel should be lowered a little.
If, on the contrary, the glider has little bar pressure, the left swivel should be raised slightly.
By turning the adjustment screw clockwise, you will have a lower swivel position and counter-clockwise a higher one.
The swivels are secured with Super glue and the certification is valid for the settings you get from our factory only. Beware that as soon as these settings are modified, the certification will no longer be valid!

Only in exceptional cases, for instance a glider with a turn, can you lower your swivels!

C. Winch and UL– Towing

The MR/MRx is suitable for winch and/or UL- towing.
You can winch tow with VG-on a little (? - ½); pulling the VG enables you to optimize your climb rate and, therefore, have a better release height. To tow with a UL it is recommended to set your VG according to the towing speed. With a slow UL (Dragonfly, big trike area) you can tow with less VG-on. With faster towing trikes it is better to use more VG (½ - ? of the VG-path).

XIII. Adjustment Values

A. Swivel Height:

You can control your swivel setting by running a cord from a batten on one side, to the same batten on the other side and measuring the distance from the bottom side of the keel (see minus sign) to the cord. For proper measurement pull the VG full on (side wires should be tight). To only control the swivel setting it is enough to measure battens # 8 and # 10.

***ATTENTION*: Settings valid only with indicated wire lengths.**

Laminar 14 MR Dacron (DHV):

	Metric System	English/U.S. System
Crossbar stop cable	760 mm	2'6"
Front-rear wires	4020-1990 or 4020-1980 mm	13'2.3"-6'6.3" or 13'2.3"-6'5.9"
Side wires	2767mm	9'1"
Batten # 7	-55 mm	-2.2"
Batten # 8	-50 mm	-2.0"
Batten # 9	-40 mm	-1.6"
Batten # 10	-80 mm	-3.2"
Batten # 11	-110 mm	-4.3"

Laminar 13 MR Dacron (DHV):

	Metric System	English/U.S. System
Crossbar stop cable	760 mm	2'6"
Front-rear wires	4070-2010 mm	13'4.2"-6'7.1"
Side wires	2500 mm	8'2.4"
Batten # 7	-50 mm	-2.0"
Batten # 8	-50 mm	-2.0"
Batten # 9	-40 mm	-1.6"
Batten # 10	-50 mm	-2.0"
Batten # 11	-75 mm	-3.0"

XIV. Service and Repair Regulations

Mandatory

- **Once year** you should remove the sail of your ICARO LAMINAR MR/MRx and check the entire frame.
- Replace the wires every **2 years**.
- **5 Year Inspection**
  According to the DHV regulations (German Hang Gliding Federation), a general inspection is mandatory after 5 years. An authorized person should carry out this inspection; if this is not done, the glider loses its certification.

After every crash, you must check your glider properly; especially the parts that received the strongest impact.
Replace the damaged parts with original spares only!
In case you are not sure of your judgment, contact your ICARO dealer.

From time to time you should compare your battens with the batten plan.
Check all the wires regularly.
The sail tension does not require any adjustments!
Dirt can be removed using warm water.
Dry your sail in order to avoid water stains.
The glider bag zipper as well as the VG pulleys should be treated with silicon spray from time to time.

XV. Technical Data

	U M.	L13MR	L 14MR
AREA	m^2	13,5	14,4
	ft^2	145	155
NOSE ANGLE	Deg.	130	130
WINGSPREAD	m	10,0	10,4
	ft	32'10"	34'1"
ASPECT RATIO		7,41	7,51
DOUBLE SURFACE	%	94	94
BATTENS (UPPER + LOWER SAIL)	#	24+6	24+6
WEIGHT – WITHOUT GLIDER BAG	kg	32	34
	lbs	71	75
PILOT HOOK-IN WEIGHT	kg	60/90	75/110
	lbs	132/198	165/243
PACKING BAG LENGTH	m	4.98	5,20
	ft	16'4"	17'1"
SHORT PACKED LENGTH	m	4,15	4,15
	ft	13'7"	13'7"
CERTIFICATION		DHV	DHV

XVI. Owner's Log

This log provides a history of the glider's ownership; please make sure details are correct when your sell the glider

DATE	NAME	PHONE	ADDRESS

NOTES

XVII. Maintenance

Write here the details of any modifications or repairs that are made to your glider.

DATE	MODIFICATION OR REPAIR

NOTES