ROTORAMA

Carbon propellers

Propellers for FPV drones
Installation, inspection and maintenance manual



Read the safety instructions in Chapter 1 before use. This product is intended for persons aged 14 and over.

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1. Safety instructions

1.1 Before you start

- Read this entire manual before installation and first flight, and keep it for future reference.
- Propellers are spare parts for FPV drones and multicopters. This product is intended for **persons aged 14 and over**. Younger persons may only handle the product under adult supervision.
- Always use the propellers in accordance with the manuals for the drone, motors and flight controller (FC) they are intended for.

1.2 Rotating propellers

Propellers spin at very high speed in flight. A rotating propeller can cause **serious cuts and lacerations** and damage eyes or property. A broken-off blade or a loose propeller is thrown into the surroundings at high speed.

- **Always install and remove propellers with the drone switched off.** Motors can start unexpectedly, for example after an accidental Arm (motors enabled) or a configuration error.
- Carry out bench tests of the motors, configuration in the configurator (e.g. Betaflight) and checks of the direction of rotation **with the propellers removed**.
- When the drone is switched on, do not stay in the plane of rotation of the propellers, do not reach into their range and keep a distance from people and animals.
- Large carbon propellers have a high tip speed and thin, stiff, sharp edges – being struck by a rotating propeller causes serious injury.
- We recommend wearing safety glasses when working on the drone and during tests.
- Never try to stop a spinning propeller with your hand or an object.

1.3 A damaged propeller is dangerous

A propeller with a cracked, bent, broken or worn blade may disintegrate in flight. An unbalanced propeller also causes vibrations that stress the motor, bearings and flight controller and impair the drone's handling.

Never straighten, glue or grind a damaged propeller – always replace it with a new one.

2. Product description

2.1 About the product

Large two-blade propeller made of carbon fibre composite (carbon) for larger drones with long flight times. It is attached with the **T-mount** system using two M3 screws. The propellers are supplied in pairs for both directions of rotation (CW and CCW).

2.2 How to read the propeller designation

Propellers are usually marked with a code that gives the diameter, pitch and number of blades. Two notations are used:

Notation	Example	Meaning
short code	1755-2	diameter 17", pitch 5.5", 2 blades
short code	2055-2	diameter 20", pitch 5.5", 2 blades

- **Diameter** is determined by the drone frame – the propeller must fit into the frame with clearance from the arms, the other propellers and the drone body.
- **Pitch** is the distance the propeller would theoretically move forward in one revolution. A higher pitch means higher speed and a higher motor load, a lower pitch means smoother flight and lower current draw.
- **Number of blades** – two-blade propellers are the most efficient (long flights), three-blade propellers are the most common compromise, more blades increase thrust on a small diameter.
- **Direction of rotation** – propellers are sold in pairs for both directions of rotation, see Chapter 3.3.

2.3 Material

The propellers are made of carbon fibre composite (carbon).

- Carbon is very stiff and light – the propeller hardly flexes under load.
- On impact it does not bend but cracks, chips, or the blade delaminates internally. Such damage may not be visible from the outside.
- Damage produces sharp splinters and fine carbon dust. Do not sand or drill a damaged propeller and do not inhale the dust.
- Carbon is electrically conductive – remove propeller fragments from the drone and from the vicinity of electronics.

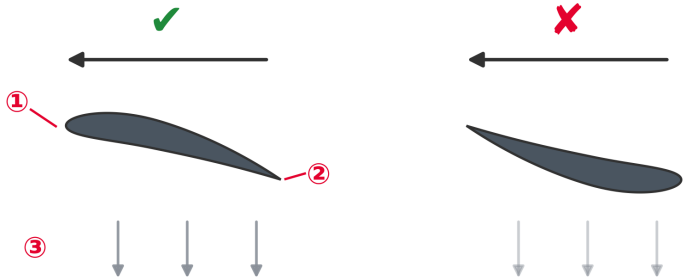
None of the materials is unbreakable. Even a durable propeller loses its shape and balance after an impact – always inspect it after a crash according to Chapter 5.

3. Orientation and direction of rotation

The most common installation mistake is a **propeller fitted upside down** or a **propeller for the opposite direction of rotation**. The drone then flips over after Arm, does not take off or behaves unstably.

3.1 Leading and trailing edge

Each propeller blade has two edges. The **leading edge** ① is rounded, thicker and **sits higher** – it goes first when the propeller rotates and “scoops” the air. The **trailing edge** ② is thin, sharp and sits lower. The propeller pushes air ③ downwards, towards the drone frame.



Cross-section of a propeller blade. The arrow at the top shows the direction of blade movement. Left: correct – the rounded leading edge ① leads, the trailing edge ② is at the rear. Right: propeller fitted upside down – the sharp trailing edge leads and the propeller produces almost no thrust.

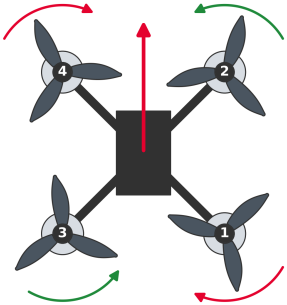
3.2 Which side faces up

The propeller is fitted with the **convex side of the blades facing up** – away from the motor. The leading edges of the blades are higher than the trailing edges and, viewed from above, the rounded edge always leads in the direction of rotation.

- Usually the side with the moulded or printed model designation and the glossier surface also faces up. However, manufacturers do not guarantee this – **the shape of the blade is always decisive**.
- A propeller fitted upside down cannot be corrected by settings in the flight controller. Always remove it and turn it over.

3.3 Direction of rotation – CW and CCW

A quadcopter has two propellers rotating **clockwise (CW)** and two **counter-clockwise (CCW)**, viewed from above. Propellers for the two directions are mirror images of each other and are therefore supplied in pairs. A propeller for a CW motor fitted on a CCW motor pushes air upwards and the drone flips over after Arm.



Top view, the arrow points forward. Betaflight default layout (Quad X, props in): motors 1 and 4 spin clockwise (CW, red), motors 2 and 3 counter-clockwise (CCW, green).

- In the Betaflight default setting the propellers spin **“inwards” (props in)** – the front blades move towards the centre above the nose of the drone.
- With the *Motor direction is reversed* option enabled (props out), all motors spin the opposite way and the propellers are fitted the other way round. This option does not change the motor direction itself – that is set in the electronic speed controllers (ESC) or by swapping the motor wires.
- Check the direction of rotation **with the propellers removed** in the configurator (*Motors* tab), and only then fit the propellers according to the actual direction.

▶ **How to tell which direction a propeller is for**

① **By the blade shape** – a reliable method for all manufacturers. Place the propeller convex side up: the blade rotates in the direction in which its higher, rounded leading edge points.

② **By the marking** – the direction of rotation is usually marked on the propeller (e.g. CW/CCW or the letter R). Markings differ between manufacturers – if in doubt, the blade shape applies.

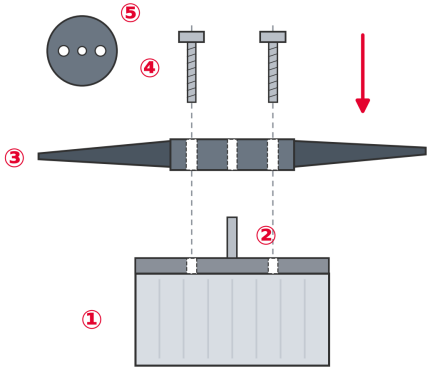
Before the first take-off, turn each propeller by hand in the motor's direction: it must push air down towards the frame.

4. Installation

4.1 What you will need

- propellers for both directions of rotation (quantity according to the drone),
- two M3 screws of suitable length per propeller – usually supplied with the motor, with some motors also with a clamping plate,
- a screwdriver or key matching the screw heads.

4.2 Installation procedure



Assembly: ① motor with threaded holes in the bell, ② centring shaft, ③ propeller, ④ M3 screws, ⑤ propeller hub viewed from above – centre hole and two screw holes.

① **Switch off the drone.**

② Check that the threaded holes in the motor bell are clean and undamaged and that the hole spacing of the propeller matches the hole spacing of the motor.

③ Using Chapter 3, determine which propeller belongs on which motor (direction of rotation) and turn it **the right way up**.

④ Fit the propeller onto the motor shaft through its centre hole so that the holes in the hub line up with the threaded holes in the bell. The whole face of the hub must sit flat.

⑤ If the motor has a clamping plate, place it on the propeller hub.

⑥ Insert both screws, first screw them in only lightly, then tighten them as described in section 4.3.

⑦ Repeat for the other motors and finally carry out the check according to Chapter 5.1.

4.3 Tightening the screws

- Tighten the screws **alternately and with feel** until the propeller sits firmly. The propeller must not move relative to the motor bell.
- An overtightened screw can crack or crush the carbon hub and strip the thread in the motor bell.
- Use the screws supplied with the motor or screws of the same length. A screw that is too long goes through the bell and may damage the motor windings; a screw that is too short does not hold in the thread.
- Replace a damaged or stripped screw.

Do not apply thread-locking adhesive to the propeller hub.

4.4 Removal

With the drone switched off, remove the screws and pull the propeller off along the motor axis. Do not lever the propeller off against the motor bell with a screwdriver – you may damage the magnets or bearings. Undamaged screws can be reused.

5. Propeller inspection

5.1 Check after installation

- Turn each propeller by hand: it must rotate freely without rubbing against the frame, cables or camera, and the blade must not “wobble” up and down.
- Check that each propeller matches the direction of rotation of its motor (Chapter 3.3) and is the right way up (Chapter 3.2).
- Check that all screws are tight.
- After the first installation or after replacing a motor, check the direction of rotation of the motors in the configurator **with the propellers removed**, and only then fit the propellers.

5.2 Check before every flight and after every crash

- Inspect both surfaces of each blade for cracks, chipped edges, delaminated material and twisted tips.
- Check the hub – it must not be cracked or deformed.
- Check that the screws are tight; vibration and hard landings can loosen them. Also check them after the first flights with new propellers and after transporting the drone.
- Listen during the first take-off – a change in sound or vibration in the camera image often reveals a damaged propeller.

5.3 When to replace a propeller

Always replace the propeller if:

- it has any crack, however small, or delaminated material,
- part of a blade is missing or the blade is bent, twisted or frayed,
- the hub or the screw holes are cracked or damaged,
- the drone vibrates after a crash and the vibration does not disappear after replacing the suspect propeller.

Propellers are consumables and are routinely damaged in flight. We recommend always having several spare propellers for both directions of rotation at hand. Damage to a propeller caused by an impact in a crash or collision is not a product defect.

6. Maintenance and storage

6.1 Cleaning

Remove dust, grass and dirt from the blades with a dry or damp cloth. Do not use solvents, thinners or petrol for cleaning – they can attack the composite binder.

6.2 Storage

- Store in a dry place, out of direct sunlight and away from heat sources (e.g. a car dashboard in summer).
- Store the propellers loose or in their original packaging so that no other objects press on them. Constant pressure bends the blades.
- Keep out of the reach of children – sharp edges and small screws can be dangerous.

6.3 Balancing

With large propellers, imbalance is very noticeable. If the drone vibrates even with new propellers, first look for the cause in the motor (bent shaft, worn bearings), the motor mounting or the flight controller settings. Do not balance carbon propellers by sanding – this weakens the blade and produces harmful dust.

7. Troubleshooting

Problem	Possible cause and solution
The drone flips over immediately after Arm and throttle up	A propeller is fitted on a motor with the opposite direction of rotation or is upside down. Check according to Chapter 3. Also check the direction of rotation and motor order in the configurator (without propellers).
The drone does not take off or has noticeably less thrust	A propeller is upside down – the sharp trailing edge is leading. Turn it the right way up.
Vibrations, jittery video, unusual noise	Damaged propeller, loose screw, bent motor shaft. Replace the propeller, tighten the screws, check the shaft.
A propeller came loose or flew off in flight	The screws were not tightened sufficiently or were missing. Always secure the propeller with both screws.
A screw cannot be tightened or keeps turning	Stripped thread of the screw or of the hole in the motor bell. Replace the screw; if the thread in the bell is damaged, the motor bell must be repaired or replaced.
The propeller rubs against the frame or cables	The propeller is too large for the frame, does not sit flat on the bell, or cables or antennas are in the path of the blades. Check that the propeller is seated correctly, reroute the cables or use propellers with a smaller diameter.

8. Information for the EU and Czech Market

8.1 Importer and responsible person in the EU

The product is placed on the European Union market by the importer stated below, who is at the same time the responsible person within the meaning of Article 16 of Regulation (EU) 2023/988 of the European Parliament and of the Council on general product safety (GPSR).

Importer / responsible person in the EU	Rotorama, s.r.o.
Company ID (IČO)	051 57 692
VAT ID (DIČ)	CZ05157692
Registered office	Okrajová 1351, 674 01 Třebíč, Czech Republic
E-mail	info@rotorama.cz
Phone	+420 252 252 098
Website	www.rotorama.cz

8.2 Product safety and identification

- The propeller is not subject to EU harmonisation legislation requiring **CE** marking and therefore does not bear it. It is placed on the market in accordance with Regulation (EU) 2023/988 on general product safety (GPSR).
- **Product identification:** the model designation is moulded or printed on the propeller and stated on the packaging. The manufacturer and model can also be found on the product page in the e-shop.
- This product is **not a toy** and is intended for persons aged 14 and over.

8.3 Disposal

- The propeller is not electrical equipment – it is not subject to the take-back of electrical equipment and does not bear the crossed-out wheelie bin symbol.
- Dispose of damaged propellers with mixed municipal waste – carbon composite does not belong in separately collected plastics.
- Dispose of the packaging in separate waste collection according to its material.

9. Warranty and rights arising from defective performance

The rights and obligations of the contracting parties are governed by Czech law, in particular by Act No. 89/2012 Coll., the Civil Code, and Act No. 634/1992 Coll., on consumer protection.

- The seller is liable to the buyer for the product being free of defects on receipt. If the buyer is a consumer, a defect may be notified **within two years of receipt** of the product (Section 2165 of the Civil Code).
- If a defect appears within **one year** of receipt, the product is deemed to have been defective already at the time of receipt (Section 2161(5) of the Civil Code).
- When purchasing online, a consumer has the right to **withdraw from the contract within 14 days** of receiving the goods without giving a reason (Section 1829 of the Civil Code).
- Claims should be made with the retailer from whom you purchased the product. The importer's contact details are given in Chapter 8.1.
- The competent body for out-of-court settlement of consumer disputes is the **Czech Trade Inspection Authority**, Štěpánská 796/44, 110 00 Prague 1, www.coi.cz.