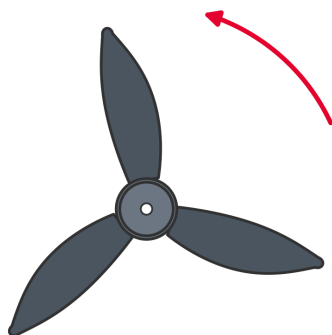




Press-fit Propellers

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.
- 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

Propeller for small FPV drones (whoop, micro). It is **press-fitted onto a smooth motor shaft** and held on it by friction, without screws or nuts. 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
diameter × pitch × blades	1.6x1.1x3	diameter 1.6", pitch 1.1", 3 blades
diameter in mm and number of blades	40mm-3	diameter 40 mm, 3 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. On drones with a propeller guard (duct), the propeller must match the duct diameter.
- **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 Materials

Propellers for FPV drones are made from two main groups of materials.

	Polycarbonate (PC)	Glass-fibre reinforced nylon
Typical use	tiny whoop, micro, toothpick	stiffer propellers for higher loads
Properties	flexible; on impact the blade tends to bend rather than break off	stiff and strong, less flexible; good vibration damping
Typical damage	bent or twisted blade, white stress marks at the bend, dented hub	cracks, especially near the hub, chipped leading edge
What to watch for	a bent blade must not be straightened – it remains weakened and unbalanced	cracks are often hairline and hard to see – inspect the blade against the light

Some propellers are also made from other compounds (e.g. carbon-fibre reinforced nylon). The same inspection and replacement rules apply to them.

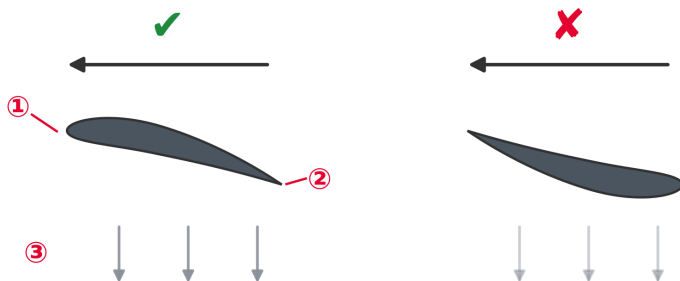
None of the materials is unbreakable. Even a durable propeller loses its shape and balance after an impact – always inspect it after a crash according to Chapter 5.

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.

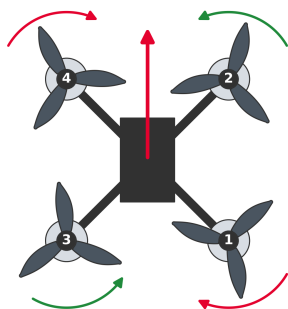
3.2 Which side faces up

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.
- Whoops are often factory-set to props out – always fit the propellers according to the actual motor direction.
- 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** – on HQProp propellers the letter **R** after the model code indicates CW rotation, the code without R is CCW. Other manufacturers may mark differently or not at all – if in doubt, the blade shape applies.

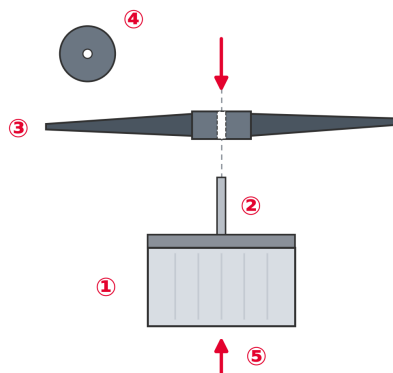
Before the first take-off, turn each propeller by hand in the motor's direction: it must push air down towards the frame.

4. Press-fit installation

4.1 What you will need

- propellers for both directions of rotation with the correct hole diameter for the shaft of your motors,
- for removal we recommend a propeller removal tool.

4.2 Installation procedure



Press-fitting the propeller: ① motor, ② smooth shaft, ③ propeller, ④ propeller hub viewed from above – centre hole for the shaft, ⑤ support the motor from below while fitting.

- ① **Switch off the drone.**
- ② Check that the hole diameter of the propeller matches the diameter of the motor shaft. Small motors usually have 0.8, 1 or 1.5 mm shafts, and propellers are made in versions with a matching hole. You will find this information in the propeller name and in the motor specifications.
- ③ Using Chapter 3, determine which propeller belongs on which motor (direction of rotation) and turn it **the right way up**.
- ④ **Support the motor from below with your fingers** so that the pressure does not load the frame and arms of the drone.
- ⑤ Place the propeller squarely on the shaft and press it evenly **all the way down** – the end of the shaft should be flush with the top of the hub.
- ⑥ Repeat for the other motors and finally carry out the check according to Chapter 5.1.

Without supporting the motor, the pressure of fitting the propeller can break the drone frame.

4.3 Holding the propeller on the shaft

- The propeller is held on the shaft by friction only. Do not use a propeller whose hole is larger than the shaft diameter – it will not hold on the shaft and may fly off in flight.
- Do not force a propeller with a smaller hole onto a thicker shaft – the hub will crack and the motor may be damaged.
- If the propeller goes onto the shaft too easily or turns on it, replace it with a new one.
- Do not glue propellers onto the shaft – they are spare parts intended to be replaced.

4.4 Removal

With the drone switched off, remove the propeller preferably with a propeller removal tool, which is slid between the propeller and the motor and pushes the propeller off along the shaft axis. Follow the tool instructions and use the tip that matches the shaft diameter.

Do not lever the propeller off with a screwdriver or with a tool at an angle, do not twist it and do not pull on the blades. The shaft of small motors is only press-fitted into the bell and can bend or slide out.

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 propellers sit fully down on the shaft and cannot easily be pulled off or turned.
- 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, burrs, bent or twisted tips and white stress marks in the plastic.
- Check the hub – it must not be cracked or deformed.
- Check that the propellers sit firmly on the shaft and have not moved up after a crash. Also check them 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 white stress marks in the material,
- part of a blade is missing or the blade is bent, twisted or frayed,
- the hub is cracked or deformed, or the propeller is loose or turns on the shaft,
- 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 attack the plastic and may cause hidden cracks.

6.2 Storage

- Store in a dry place, out of direct sunlight and away from heat sources (e.g. a car dashboard in summer) – heat can deform the blades. In frost, plastics become more brittle and the propeller cracks more easily.
- 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 parts can be dangerous.

6.3 Balancing

Manufacturers of FPV propellers supply them balanced from the factory. 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 propellers by sanding or adding glue – this weakens the blade.

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 or deformed propeller, propeller partly pulled off, bent motor shaft. Replace the propeller, press it fully down, check the shaft.
A propeller flew off in flight	The propeller hole was too large or worn and the propeller did not hold on the shaft. Use a new propeller with the correct hole diameter and press it fully down.
The propeller cannot be fitted onto the shaft	The propeller hole is smaller than the shaft diameter. Use a propeller with the correct hole diameter; do not force the propeller on.
The motor shaft is bent or has slid out	The propeller was removed at an angle, by levering or by pulling on the blades. The motor must be repaired or replaced; in future remove propellers according to Chapter 4.4.
The propeller rubs against the frame, propeller guard or cables	The propeller is too large for the frame or guard, is not fitted squarely, or cables, the antenna or camera 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@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.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 wheellie bin symbol.
- Dispose of damaged propellers in accordance with the plastic waste sorting rules of your municipality; if in doubt, dispose of them with mixed municipal waste.
- 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.