ROTORAMA

ECO II 2004 3000KV

EMAX — brushless motor for FPV drones
User manual



Read the safety instructions before installation. Keep the propellers removed during all work on the drone.

Rotorama, s.r.o. · www.rotorama.com

Contents

1. Safety instructions

1.1 Before you start

1.2 Spinning propellers and mechanical hazards

1.3 Electrical safety and temperature

2. Product description

2.1 What the motor is for

2.2 Package contents

2.3 Technical data

2.4 Dimensions and mounting holes

2.5 Manufacturer's test data

3. Installation and wiring

3.1 What else you need

3.2 Mounting the motor on the frame

3.3 Connecting to the electronic speed controller (ESC)

3.4 Checking the direction of rotation

3.5 Fitting the propeller

4. Operation

4.1 Choosing the battery and propeller

4.2 Test before the first flight

4.3 Operating the assembled drone

5. Maintenance and troubleshooting

5.1 After every flight and storage

5.2 Troubleshooting

6. Information for the EU and Czech Market

7. Warranty and rights arising from defective performance

1. Safety instructions

1.1 Before you start

The EMAX ECO II 2004 3000KV motor is a component intended to be installed in an FPV drone. Installation, wiring and testing may only be carried out by a person with basic experience in soldering and building FPV drones. The product is not a toy and must be kept out of the reach of children.

- Before installation, read this entire manual and the manuals of the other drone components (flight controller (FC), electronic speed controller (ESC), propellers, battery).
- Do not modify the product in any way (do not drill the bell, shorten the shaft or rewind the windings). Do not use a damaged motor.
- Keep small parts (screws, washer) out of the reach of children — they present a choking hazard.

1.2 Spinning propellers and mechanical hazards

- The motor reaches very high speeds. A spinning propeller can cause serious cuts.
- **Keep the propellers removed during all work on the drone (installation, configuration, soldering, motor direction check).** Fit the propellers only just before flying.
- Keep your hands, face and loose objects (hair, clothing, cables) away from a spinning motor.
- Before connecting the battery, always check that the radio transmitter is switched on and the drone is in the Disarm state (motors off).

1.3 Electrical safety and temperature

- Never connect the motor directly to a battery. It must be powered exclusively through an electronic speed controller (ESC) for brushless motors.
- The battery cell count must not exceed the range specified by the manufacturer (3S–6S LiPo).
- The motor heats up during operation. Do not touch it after a flight until it has cooled down — risk of burns.
- Stop using an overheated motor immediately (burnt smell, discoloured windings).
- Charge and store LiPo batteries according to their manufacturer's instructions; improper handling can cause a fire.

2. Product description

2.1 What the motor is for

The EMAX ECO II 2004 3000KV is a brushless outrunner motor of size 2004 for FPV drones with 3"–5" propellers. The rotor uses N52SH arc magnets, the base is made of 7075 aluminium alloy, the shaft is steel and the bearings are NSK precision bearings. The windings use multi-strand wire.

The 3000KV version is suited above all to 3" drones on 6S batteries and to lightweight 4" and 5" drones on 3S–4S batteries. The propeller is attached with the T-mount system to a 1.5 mm shaft, which keeps the motor weight low.

2.2 Package contents

Qty	Item
1×	EMAX ECO II 2004 3000KV motor with 120 mm leads
5×	M2 × 6 mm screw
5×	M2 × 7.5 mm screw
3×	M2 × 8.5 mm screw
1×	shaft washer and screw

Propellers, electronic speed controller (ESC), frame, battery and connectors are **not** included.



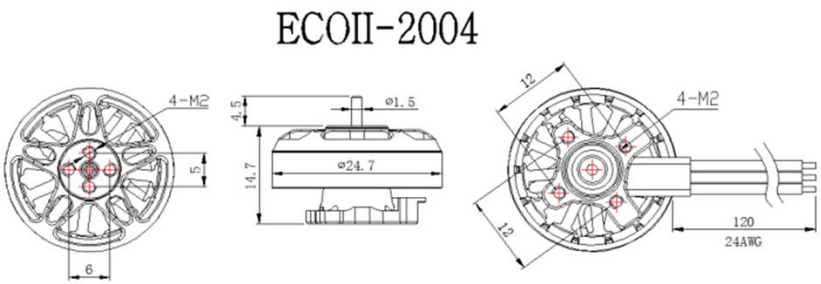
ECO II 2004 3000KV motor with packaging and screw set

2.3 Technical data

Parameter	Value
Designation	EMAX ECO II 2004 3000KV
KV	3000
Configuration (stator teeth / poles)	12N14P
Dimensions (diameter × length)	ø 24.7 × 19.2 mm
Weight	16.4 g (without silicone wires)
Battery cell count	3S–6S LiPo
Recommended propellers	3"–5"
Idle current (10 V)	1.1 A
Internal resistance	80 mΩ
Peak current (6S)	32 A
Maximum power (6S)	810 W
Bearing shaft	ø 3 mm, steel
Propeller shaft	ø 1.5 mm (T-mount)
Mounting pattern	12 × 12 mm, 4 × M2
Leads	3 × silicone wire 24 AWG, 120 mm
Magnets / base	N52SH (arc) / Al 7075
Bearings	NSK

※ Data provided by the manufacturer EMAX.

2.4 Dimensions and mounting holes



Dimensional drawing (dimensions in mm). Left: top view with 4 M2 holes for the propeller; centre: side view; right: bottom view with 12 × 12 mm mounting pattern (4 × M2).

2.5 Manufacturer's test data

EMAX has published the following test results for the ECO II 2004 3000KV motor with four types of propeller. The data are intended for rough comparison; actual values depend on the battery, ESC, propeller and temperature. The manufacturer does not state the speed at full throttle.

▶ HQ T3×3×3, 2-blade — voltage 22.2 V

Throttle (%)	Current (A)	Thrust (g)	Power (W)	Efficiency (g/W)	Speed (rpm)
40	5.9	300	130.98	2.29	30,500
50	7.7	364	170.94	2.13	33,500
60	8.3	378	184.26	2.05	34,200
70	10.7	472	237.54	1.99	37,800
80	11.6	529	257.52	2.05	40,300
90	12.2	545	270.84	2.01	41,800
max.	12.7	561	281.94	1.99	—

▶ Gemfan 3520, 3-blade — voltage 22.2 V

Throttle (%)	Current (A)	Thrust (g)	Power (W)	Efficiency (g/W)	Speed (rpm)
40	6.1	345	135.42	2.55	31,500
50	7.5	407	166.50	2.44	34,000
60	8.1	414	179.82	2.30	34,600
70	10.2	516	226.44	2.28	38,000
80	11.1	582	246.42	2.36	40,500
90	11.8	603	261.96	2.30	41,900
max.	12.4	636	275.28	2.31	—

▶ EMAX AVAN 5120, 3-blade — voltage 16 V

Throttle (%)	Current (A)	Thrust (g)	Power (W)	Efficiency (g/W)	Speed (rpm)
40	6.7	378	107.20	3.53	16,700
50	9.9	477	158.40	3.01	18,600
60	13.9	629	222.40	2.83	21,100
70	19.4	796	310.40	2.56	23,000
80	26.3	980	420.80	2.33	24,800
90	30.5	1060	488.00	2.17	25,970
max.	31.6	1170	505.60	2.31	—

▶ Gemfan SL5125, 3-blade — voltage 16 V

Throttle (%)	Current (A)	Thrust (g)	Power (W)	Efficiency (g/W)	Speed (rpm)
40	6.5	370	104.00	3.56	17,800
50	9.5	476	152.00	3.13	19,800
60	12	598	192.00	3.11	22,200
70	17.8	764	284.80	2.68	24,600
80	24.7	920	395.20	2.33	26,400
90	29.6	1010	473.60	2.13	28,680
max.	30.2	1090	483.20	2.26	—

3. Installation and wiring

3.1 What else you need

- an FPV drone frame with a 12 × 12 mm motor mounting pattern and holes for M2 screws,
- an electronic speed controller (ESC) for brushless motors, rated for the cell count used and with sufficient current headroom (the motor manufacturer specifies a peak current of 32 A at 6S),
- 3"–5" propellers with T-mount attachment for a 1.5 mm shaft,
- a 3S–6S LiPo battery, soldering iron, solder, heat-shrink tubing and a hex key for M2 screws,
- a computer with the flight controller configuration software (e.g. Betaflight Configurator).

3.2 Mounting the motor on the frame

① Place the motor on the frame arm so that the 4 M2 holes in the base (12 × 12 mm pattern) line up with the holes in the frame and the leads point towards the centre of the drone.

② Choose the screw length according to the arm thickness. The package contains M2 × 6 mm, M2 × 7.5 mm and M2 × 8.5 mm screws.

③ Tighten the screws evenly in a cross pattern and gently — the threads in the aluminium base strip easily. We recommend securing the threads with medium-strength threadlocker.

④ After tightening, turn the bell by hand. It must rotate freely, without rubbing and without unusual noises.

※ A screw that is too long will touch the stator windings and damage their insulation — resulting in a short circuit and destruction of the motor and the ESC. If the bell turns stiffly or rubs after tightening, replace the screw with a shorter one immediately.

3.3 Connecting to the electronic speed controller (ESC)

- The motor has three leads. Solder them to the solder pads of one ESC channel (motor phases). The order of the wires only determines the direction of rotation.
- You can shorten the wires to the required length. Strip and tin the shortened ends and solder quickly so that neither the insulation nor the ESC overheats.
- After soldering, check that there is no solder bridge between adjacent pads and that the wires are not pinched anywhere or in contact with the carbon frame.
- Secure the wires on the arm (cable tie, heat-shrink tubing) so that they cannot get into the propeller.

3.4 Checking the direction of rotation

Carry out this check **without propellers**. In the flight controller configuration software (e.g. Betaflight Configurator, *Motors* tab), spin the individual motors at low speed and compare their direction of rotation with the motor layout selected in the flight controller.

- If a motor spins the wrong way, change its direction in the ESC configuration (e.g. in ESC Configurator) or swap any two of the three motor leads.
- If the flight controller uses reversed rotation for all motors (*Motor direction is reversed*), follow that setting.

3.5 Fitting the propeller

- Use a propeller with a T-mount hub for a 1.5 mm shaft. Place the propeller on the shaft and fasten it with M2 screws into the threaded holes in the motor bell. The number and length of the screws are specified by the propeller manufacturer.
- Make sure the propeller direction (CW/CCW) matches the motor's direction of rotation.
- Tighten the propeller screws gently and evenly; before every flight check that the propeller is held firmly and is not damaged.
- Fit the propellers only after all settings and checks according to chapter 3.4 have been completed.

4. Operation

4.1 Choosing the battery and propeller

The manufacturer specifies a range of 3S–6S and 3"–5" propellers for the ECO II 2004 3000KV motor. The manufacturer's measurements (chapter 2.5) cover 3" and 3.5" propellers at 22.2 V (6S) and 5" propellers at 16 V (4S). For any combination not covered by the manufacturer's data, first check it with a short flight and by checking the motor temperature.

Always fit a **fully charged** battery before flying. Binding LiPo battery voltages:

State	Per cell	3S	4S	5S	6S
Fully charged	4.20 V	12.6 V	16.8 V	21.0 V	25.2 V
End the flight	3.5 V	10.5 V	14.0 V	17.5 V	21.0 V
Storage	3.8 V	11.4 V	15.2 V	19.0 V	22.8 V

4.2 Test before the first flight

① Without propellers, check the direction of rotation of all motors (chapter 3.4).

② Fit the propellers, place the drone in an open area, step back to a safe distance and Arm (switch on the motors).

③ Hover briefly low above the ground. After landing and Disarm (motors off), disconnect the battery and check the motor temperature.

④ If the motors are very hot, check your choice of propeller and battery and the flight controller filter settings.

4.3 Operating the assembled drone

An assembled drone with this motor is subject to the rules for unmanned aircraft, in the EU in particular Regulation (EU) 2019/947. National implementing rules differ from country to country — operator registration, pilot competency, geographical zones, insurance and permitted radio frequencies. **The law of the country in which you operate the drone always prevails.** Familiarise yourself with that country's rules before your first flight.

5. Maintenance and troubleshooting

5.1 After every flight and storage

- Disconnect the battery and let the motors cool down.
- Check that the bell turns freely and smoothly, without play and without rubbing. Rough running or play in the bell indicate worn bearings.
- Remove dirt, grass and sand from the gap between the bell and the stator. Carefully remove any metal particles caught on the magnets.
- Check the tightness of the motor and propeller screws, the condition of the wires and solder joints, and whether the shaft is bent.
- Do not straighten a bent shaft — a motor with a bent shaft vibrates and stresses the bearings.
- Store the motor in a dry place, out of direct sunlight and in a clean environment free of metal filings and dust that the magnets could attract. Let a wet motor dry thoroughly before using it again.

5.2 Troubleshooting

Problem	Possible cause and solution
Motor spins the wrong way	Change the direction in the ESC configuration or swap two motor leads (chapter 3.4).
Motor does not spin, only twitches or beeps	Cold or broken joint on one of the phases, solder bridge between pads. Check the soldering of all three leads.
Bell rubs or turns stiffly	Mounting screw too long, dirt in the rotor gap, damaged bearing. Check the screw length (chapter 3.2).
Strong vibrations	Damaged or unbalanced propeller, bent shaft, loose screws. Replace the propeller and tighten the screws.
Motor is very hot after a flight	Propeller too large or aggressive for the battery used, unsuitable FC filter settings, damaged windings. Choose a smaller propeller or a lower voltage.
Burnt smell, smoke	Disconnect the battery immediately. Do not use the motor or the ESC any further.

6. Information for the EU and Czech Market

6.1 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.com

6.2 Product conformity

CE

- The product bears the **CE** marking and complies with the requirements of the applicable European Union harmonisation legislation.
- A copy of the **EU Declaration of Conformity** is available from the importer at the address stated above or at the e-mail address info@rotorama.cz.
- **Product identification:** the type designation (EMAX ECO II 2004 3000KV) is given on the product packaging; the motor size and KV value are marked on the motor.

6.3 Disposal of electrical equipment



- The crossed-out wheeled bin symbol on the product, its packaging or in the documentation means that at the end of its service life the product **must not be disposed of together with mixed municipal waste**.
- Hand it over at a take-back point for electrical equipment – at a collection yard, at a take-back point of a collective system, or at the retailer when purchasing a new equivalent product. Take-back is free of charge for the end user.
- The obligations under Act No. 542/2020 Coll., on end-of-life products, are fulfilled by the importer through a collective take-back system.
- Proper disposal helps prevent negative impacts on the environment and human health and contributes to the reuse of secondary raw materials.

Through its contractual partner **ASEKOL a.s.**, the company ensures the take-back of waste electrical equipment from households and the separate collection of waste electrical equipment, batteries and accumulators in accordance with the applicable legislation. The customer is entitled to hand over old electrical equipment or a battery or accumulator at any collection point of the above contractual partner. The addresses of these take-back points are listed at www.asekol.cz, www.ecobat.cz and also https://visoh2.mzp.cz/RegistrMistZO/RegistrMistZOPublic/MapaMistZpetOdberu.

7. 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 6.1.
- 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.