F411 15A AIO

DarwinFPV 15A 1-3S F411 Ultralight/Whoop AIO
Flight controller (FC) with 4-in-1 speed controllers (ESC)



Read this entire manual carefully before installation and first connection. The board is intended to be built into a drone and requires soldering.

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1. Safety instructions

1.1 General principles

The DarwinFPV F411 15A AIO board is an electronic component intended to be built into a small multicopter (drone). Installation requires experience with soldering and wiring FPV drone electronics. If you are unsure, have the installation done by an experienced modeller.

- The product is not a toy and is not intended for children.
- When working on the drone – wiring, configuring and tuning – **always remove the propellers**. The motors may spin up unexpectedly.
- Never power the board until you have checked that there is no short circuit between the + and − pads or between any other adjacent pads (solder bridge, stray wire strand).
- Do not exceed the permitted input voltage and current range given in Chapter 2.3.
- Protect the board from moisture, water, dust and metal objects. Do not connect a wet or damaged board to a battery.
- The speed controllers (ESC) and the voltage regulator (BEC) heat up during operation. Do not touch them after a flight until they have cooled down.

1.2 Power supply and Li-Po batteries

The board is powered from a Li-Po (or LiHV) battery with 1 to 3 cells (1–3S). The battery is not included.

- Charge Li-Po batteries only with a charger designed for them, under supervision and on a non-flammable surface. Do not leave a charging battery unattended.
- Do not use a mechanically damaged, swollen or overheated battery any longer; hand it over for environmentally sound disposal.
- Do not discharge the battery below 3.5 V per cell; store it at 3.8 V per cell (see Chapter 4.5 for details).
- Always check the polarity when connecting the battery. Reverse polarity will permanently destroy the board.

1.3 Soldering and installation

- Solder in a well-ventilated area, use a holder and wear safety glasses.
- The solder pads are small. Use a fine tip and a reasonable amount of solder – overheating can lift a pad off the board.
- Solder the power leads with sufficient temperature and solder so that the joint is shiny and solid.
- After soldering, clean flux residue from the board and inspect every joint under a magnifier.

- A lifted pad or other mechanical damage to the board caused during installation is not a product defect.

1.4 Drone operation and regulations

A drone built with this board is an unmanned aircraft. Its operation is governed by Regulations (EU) 2019/945 and 2019/947, which apply in all EU Member States, but national implementing rules differ from country to country – registration portals, minimum pilot age, geographical zones, mandatory insurance, permitted frequency bands and maximum transmit power. If you operate the drone in another country, you must follow the regulations of the country in which you are flying. In the Czech Republic, information is provided by the Civil Aviation Authority (www.caa.gov.cz).

※ The person who builds and operates the drone is responsible for its construction, configuration and safe operation.

2. Product description

2.1 What the board is for

The DarwinFPV 15A 1-3S F411 AIO (all-in-one) combines on a single board a **flight controller (FC)** with an STM32F411 processor, gyroscope and OSD chip and **four 15 A speed controllers (ESC)** running BLHeli_S firmware. It is intended for lightweight drones and whoops powered by a 1–3S battery. The capacitor on the power input comes pre-soldered.

The board has a 5 V voltage regulator (BEC) for powering the receiver, camera, video transmitter, LEDs and buzzer, and two hardware UART serial ports. According to the manufacturer, both analogue and digital video transmitters can be connected to the board.

2.2 Package contents

Qty	Item
1×	DarwinFPV 15A 1-3S F411 AIO board (with pre-soldered capacitor)
5×	motor connector (SH1.25, female)
1×	power lead (20 AWG, 70 mm)
1×	XT30 connector
5×	rubber shock absorber grommet (soft mount) M2 × 6.6

Not included: motors, receiver, camera, video transmitter, battery, frame, propellers and USB cable.



Board and accessories in the package (manufacturer's illustrative photo)

2.3 Specifications

▶ Speed controllers (ESC)

Input voltage	3.0–13.5 V DC (1–3S Li-Po)
Continuous current	15 A
Peak current	17 A
ESC processor	EFM8BB21F16G, 48 MHz
Protocol	DShot / Oneshot / Multishot
Firmware	BLHeli_S, target S-H-50
BEC output from ESC	no
ESC telemetry	no
Current sensor	no

▶ Flight controller (FC)

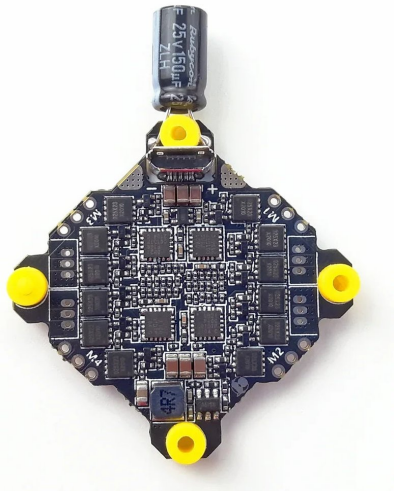
Processor	STM32F411CEU6, 100 MHz
Gyroscope (IMU)	MPU6000 (SPI)
OSD	AT7456E
Barometer	no
Blackbox	no
Serial ports	2× UART (UART1, UART2)
SBUS input	built-in inverter on UART1-RX
Softserial	1× (pad S5)
Supply voltage	3.0–13.5 V DC (1–3S Li-Po)
5 V BEC	2 A continuous (max. 2.5 A)
3.3 V regulator (LDO)	max. 200 mA
Battery voltage measurement	1:10 divider (scale 110)
Betaflight target	MATEKF411
Weight	5.4 g (board with capacitor, according to the manufacturer's photo)
Mounting	hole spacing 25.5 × 25.5 mm, M2 screws

2.4 Board overview

The top side carries the processor, gyroscope, OSD chip and the solder pads for peripherals. The bottom side carries the speed controllers with motor pads M1–M4 and the USB connector. The capacitor is soldered to the + and − power pads.



Top side of the board (flight controller)

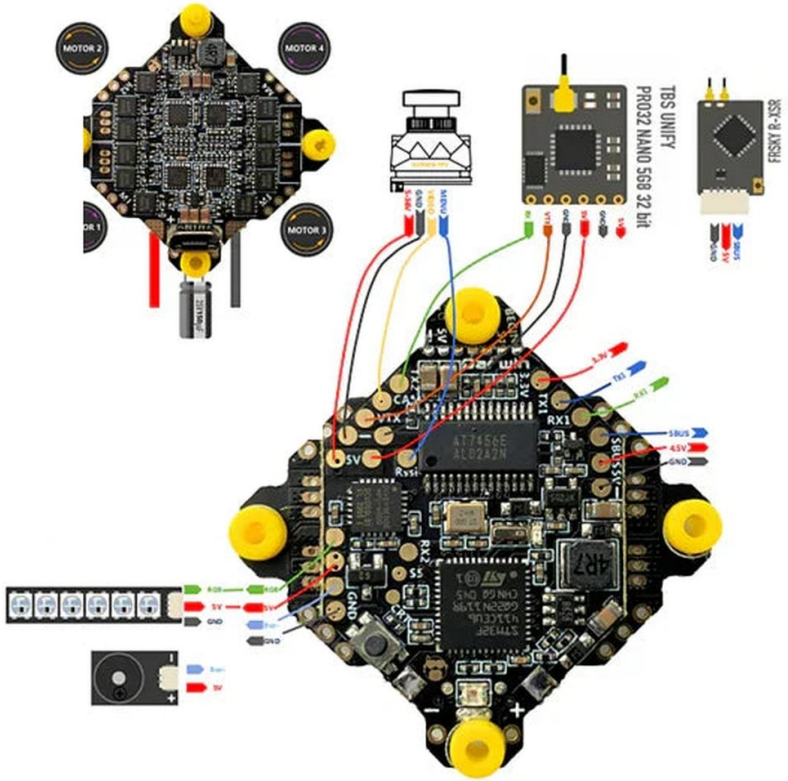


Bottom side of the board (speed controllers, pads M1–M4, USB connector)

3. Installation and wiring

3.1 Wiring diagram

The figure below is the manufacturer's wiring diagram. It shows the connection of the motors, camera, video transmitter, SBUS receiver, LED strip and buzzer. Before soldering, always check the pad labels directly on the board.



Wiring diagram (manufacturer's drawing; pad labels as printed on the board)

3.2 Power and capacitor

① Solder the supplied power lead to the **+** and **−** power pads. The red wire goes to +, the black wire to −.

② Solder the supplied XT30 connector, or another connector matching your battery, to the other end of the lead. Insulate the joints with heat-shrink tubing.

③ The capacitor comes pre-soldered. Do not remove it – it suppresses voltage spikes generated by the speed controllers and thus protects the drone's

electronics.

④ Before connecting a battery for the first time, use a multimeter to check that there is no short circuit between + and −.

3.3 Motors

The speed controller outputs are marked **M1–M4** on the bottom side of the board. The motor layout corresponds to the manufacturer's diagram (Motor 1 to Motor 4) and to the default quad X layout in Betaflight.

- Motors with a plug can be connected via the supplied SH1.25 sockets, which are soldered to the motor pads. Solder motors without a plug directly to the pads.
- The order of the three motor wires determines the direction of rotation. The direction can be changed later in software (Chapter 4.3); re-soldering is not necessary.
- Route the motor wires so that they cannot get into the propellers or chafe against the frame.

3.4 Receiver

Connect a receiver with an **SBUS** signal to the **SBUS** pad and to the corresponding power and GND pads as shown in the diagram. The SBUS input is routed to UART1-RX through a built-in inverter, so no modification is needed.

Connect a serial receiver (e.g. CRSF / ExpressLRS) to the **RX1** and **TX1** pads (receiver TX to RX1, receiver RX to TX1) and power it as required by the receiver: pad **3.3V** (max. 200 mA) or **5V**.

※ Always check the receiver's supply voltage in its manual. A 3.3 V receiver connected to 5 V will be destroyed.

3.5 Camera and video transmitter (VTX)

- **Analogue camera:** video to the **CAM** pad, power to **5V** and **−** (GND).
- **Analogue video transmitter:** video to the **VTX** pad, power to **5V** and GND. Connect the VTX control wire (e.g. SmartAudio) to **TX2**; in the manufacturer's configuration backup, UART2 is set up for SmartAudio.
- The OSD (on-screen data) is provided by the AT7456E chip and works with an analogue video signal.
- According to the manufacturer, a digital video transmitter can also be connected. Always check that its current draw does not exceed the capacity of the 5 V BEC (2 A continuous, max. 2.5 A) – otherwise power it from another source according to its manual.

※ Never switch on a video transmitter without an antenna connected – it may be damaged.

3.6 LED strip and buzzer

- **Addressable LED strip:** data wire to the **RGB** pad, power to **5V** and **GND**. The LED_STRIP feature is enabled in the manufacturer's configuration backup.
- **Buzzer:** negative wire to the **Buz−** pad, positive wire to **5V**.

3.7 Other pads (RSSI, CRT, S5)

According to the manufacturer, some pads have additional functions that can be used after changing the configuration:

Pad	Function according to the manufacturer
RSSI	pin PA0 (TIM5_CH1); can be remapped to softserial or camera control (Camera Control) with the CLI command: *resource camera_control A00*
CRT	signal input for an external current sensor (max. 3.3 V)
S5	pin PB3; can be remapped to softserial, e.g. for SmartPort telemetry

3.8 Mounting in the frame

- Insert the supplied rubber grommets (soft mounts) into the mounting holes. They damp vibrations and protect the gyroscope.
- Tighten the M2 screws only lightly so that the grommets are not deformed and the board is not under tension in the frame.
- Orient the board according to the manufacturer's diagram (positions Motor 1–4 correspond to the default Betaflight layout). If you rotate it differently, set the rotation in Betaflight (*Configuration → Board and Sensor Alignment*).
- Make sure the bottom side of the board with the speed controllers does not touch a carbon frame – carbon is conductive.

4. Setup in Betaflight

4.1 Connecting to a computer

① Install the current **Betaflight Configurator** (betaflight.com).

② Remove the propellers. Connect the board to the computer with a USB cable via the connector on the bottom side of the board.

③ In the software, select the serial port and click *Connect*.

④ On the *Setup* tab, check that the model on screen moves in the same way as the drone in your hand. Place it on a level surface and run *Calibrate Accelerometer*.

USB power is sufficient for configuring the flight controller. The speed controllers, motors and video transmitter only start after a battery is connected.

4.2 Receiver setup

- In the manufacturer's configuration backup, **Serial RX** is set on UART1 with the **SBUS** protocol.
- For a serial receiver (CRSF / ExpressLRS), keep Serial RX on UART1 on the *Ports* tab and select the corresponding protocol on the *Receiver* tab.
- On the *Receiver* tab, check that the channels respond correctly to the sticks of your radio and that the channel order matches your radio.

4.3 Checking motors and rotation direction

※ The propellers must be removed during this check!

① Connect the battery and connect the board to the computer.

② On the *Motors* tab, confirm the safety warning and spin up the motors one by one.

③ Check that the motor that spins is the one matching the number in the software and that it rotates in the correct direction according to the diagram in Betaflight.

④ Correct a wrong direction of rotation in the ESC configuration tool or by swapping two motor wires.

The speed controllers communicate with the flight controller using the DShot protocol. DShot300 is set in the manufacturer's configuration backup.

4.4 Arm, Disarm and failsafe

- On the *Modes* tab, assign the **Arm** function (motors on) to a dedicated two-position switch on your radio. The motors are switched off (**Disarm**) with the same switch.
- We also recommend assigning safety modes, e.g. *Beeper* for finding the drone (requires a connected buzzer).

- On the *Failsafe* tab, check the behaviour on signal loss. Test failsafe without propellers: after Arm, switch the radio off – the motors must stop.
- Arm a drone with propellers fitted only on the ground and at a safe distance from people.

4.5 Battery voltage monitoring

The board measures the battery voltage (1:10 divider, *scale 110* in Betaflight). On the *Power & Battery* tab, compare the displayed voltage with a multimeter. Show the voltage in the OSD and end the flight no later than at the value given below.

State	per cell	1S	2S	3S
fully charged Li-Po	4.20 V	4.20 V	8.40 V	12.6 V
fully charged LiHV	4.35 V	4.35 V	8.70 V	13.05 V
end the flight	3.5 V	3.5 V	7.0 V	10.5 V
storage	3.8 V	3.8 V	7.6 V	11.4 V

The board only measures voltage; it has no current sensor. An external current sensor can, however, be connected to the CRT pad (Chapter 3.7).

5. Firmware

5.1 Flight controller firmware

The flight controller is supplied with **Betaflight** firmware. The manufacturer states the target **MATEKF411**; the configuration backup (CLI) offered for download by the manufacturer carries the board name **DARWINF411**. The firmware file and the configuration backup can be found in the *Support* section of the manufacturer's product page (darwinfpv.com).

① Before updating, save a backup of your settings in the *CLI* tab using the *diff all* command.

② In Betaflight Configurator, open the *Firmware Flasher* tab, select the board target and flash the firmware. The board switches to flashing mode (DFU) automatically.

③ After the update, restore the manufacturer's configuration backup or your own backup and check the settings.

※ Do not disconnect the board while the firmware is being flashed. A wrong target or an interrupted flash can leave the outputs non-functional.

5.2 Speed controller (ESC) firmware

The speed controllers use **BLHeli_S** firmware, target **S-H-50**. The manufacturer also offers the ESC firmware file on the product page. Configure and update the speed controllers through the flight controller (passthrough) in a BLHeli_S configurator. Update the speed controllers only when necessary and always without propellers.

6. Before the first flight

- Check all solder joints, especially the power pads and motor wires.
- Check the direction of motor rotation (Chapter 4.3) and that the propellers are fitted according to the direction of rotation.
- Check the Arm / Disarm function and failsafe (Chapter 4.4).
- Insert a **fully charged** battery and check that the voltage shown in the OSD matches reality.
- When connecting a battery to the fitted electronics for the first time, we recommend using short-circuit protection (a so-called smoke stopper).
- Make the first flight in an open area, away from people and obstacles, and check the temperature of the speed controllers and motors after landing.

7. Maintenance and troubleshooting

7.1 Maintenance

- After every crash, check the board, the capacitor and the solder joints. Re-solder a loose capacitor.
- Keep the board clean and dry. Remove dirt with a soft brush or, if necessary, isopropyl alcohol.
- Check the rubber grommets regularly; replace hardened or torn ones.
- Disconnect the battery between flights.

7.2 Troubleshooting

Problem	Possible cause and solution
The computer does not detect the board	Use a USB data cable (not a charge-only cable) and a different port. Install the drivers from Betaflight Configurator.
Motors do not spin	Is a battery connected? Check the DShot protocol on the *Configuration* tab. If bidirectional DShot is enabled and the ESC firmware does not support it, disable it.
The drone cannot be armed	On the *Setup* tab, find the reason for the block (Arming disable flags), e.g. the throttle stick is not at the bottom or there is no receiver signal.
The receiver does not communicate	Check the UART, protocol and TX/RX wiring (crossed). For SBUS, use the SBUS pad.
No OSD in the video	Check that the video runs from the camera to CAM and from the VTX to VTX, and check the OSD setting (PAL/NTSC).
OSD voltage is incorrect	On the *Power & Battery* tab, adjust the scale according to a multimeter.
The drone flips over on take-off	Wrong motor order or direction, propellers fitted the wrong way round, wrong board orientation.

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.com

8.2 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 (DarwinFPV 15A 1-3S F411 AIO) is given on the product packaging; the board carries the manufacturer's print. The flight controller firmware version can be found in Betaflight Configurator.

8.3 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.

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.