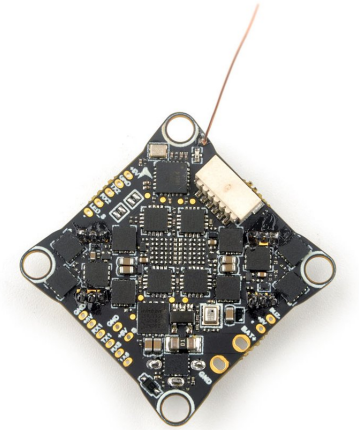
CrazyF405HD ELRS AIO

1–2S AIO board: F405 FC + 4× 12 A ESC + 2.4 GHz ELRS receiver

User manual



Read this manual carefully before installation and first use, especially the safety instructions in Chapter 1.

Importer: Rotorama, s.r.o. · www.rotorama.com · info@rotorama.cz

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1. Safety instructions

Read this entire manual before installation and first use and keep it for future reference. The **CrazyF405HD ELRS 1-2S AIO** board is an electronic component for building small FPV drones. It is not a toy and is not intended for children.

1.1 General rules

- Carry out installation, wiring and configuration only if you have adequate knowledge of building FPV drones. Incorrect wiring may permanently damage the board or the connected devices.
- Always **remove the propellers** during any configuration, motor test or firmware update. The motors may start unexpectedly.
- Never connect the board to a battery with more cells than stated in the technical data (1S–2S).
- Protect the board from moisture, dust, metal chips and carbon dust – there is a risk of a short circuit.
- Always inspect the board after a crash. Do not continue to use a damaged, bent or burnt board.

1.2 Li-Po and LiHV batteries

- The board is powered from an external 1S–2S Li-Po or LiHV battery. The battery is not included.
- Charge batteries only with a charger designed for the given cell type, under supervision and on a non-flammable surface.
- Do not use swollen, punctured or otherwise damaged batteries.
- Always disconnect the battery after the flight. Do not leave it connected to the board unattended.
- The binding voltage values are given in Chapter 4.3.

1.3 Installation, soldering and static electricity

- The board contains components sensitive to static electricity. Ground yourself before handling it and hold the board by its edges.
- Solder with a temperature and heating time appropriate for small pads. Prolonged heating may lift a pad.
- Before connecting a battery for the first time, check with a multimeter that there is no short circuit between the power leads.
- For the first power-up we recommend using short-circuit protection (a so-called smoke stopper).

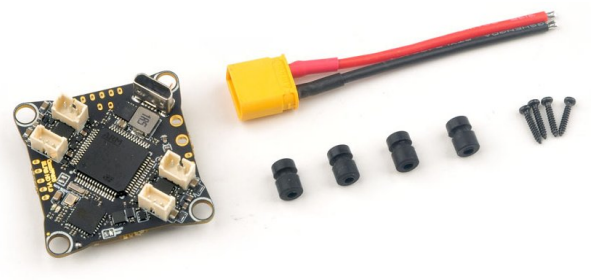
2. Product description

2.1 What the board is for

The CrazyF405HD ELRS 1-2S AIO is an AIO (all-in-one) board for small FPV drones with digital video transmission – whoops, cinewhoops and toothpicks. On a single board with a 25.5 × 25.5 mm mounting hole pattern it combines a **flight controller (FC)** with an F405 processor, **four electronic speed controllers (ESC)** rated at 12 A and an **ExpressLRS 2.4 GHz receiver** connected via a serial port (UART).

The board has no analog OSD chip – it is intended for digital video transmitters that display the OSD themselves. It includes a barometer and blackbox memory. The manufacturer states support for Betaflight and INAV firmware.

2.2 Package contents

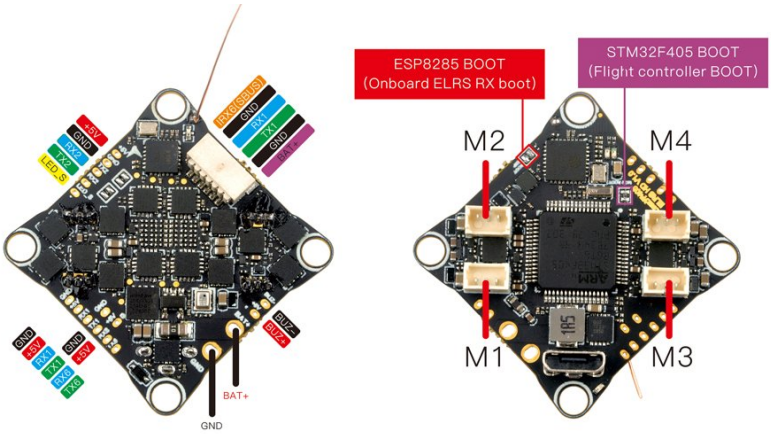


Package contents

- 1× CrazyF405HD ELRS 1-2S AIO board with receiver antenna
- 1× power lead with XT30 connector
- 1× set of rubber damping grommets (softmount)
- 1× set of screws

Not included: motors, propellers, frame, video transmitter and its cable, camera, battery, charger, radio transmitter and USB cable.

2.3 Wiring and pin description



Wiring diagram by the manufacturer – top side on the left, bottom side on the right

Pin	Function
BAT+ / GND	power from a 1S–2S battery (XT30 lead)
M1–M4	motor connectors (bottom side)
6-pin connector	RX6(SBUS), GND, RX1, TX1, GND, BAT+ – for a digital video transmitter
TX1 / RX1	UART1 – by default video transmitter (MSP + DisplayPort)
TX2 / RX2	UART2 – connected to the onboard ELRS receiver
TX6 / RX6	UART6 – free port for other devices
+5V / GND	5 V supply for connected devices
LED_S	LED strip signal
BUZ+ / BUZ−	buzzer connection
STM32F405 BOOT	flight controller BOOT button (DFU mode)
ESP8285 BOOT	BOOT of the onboard ELRS receiver

※ According to the manufacturer, only version v1.0 has silk screen printing errors; versions V1.1 and V2.0 have them fixed. Follow the diagram above when wiring.

2.4 Technical data

▶ Flight controller (FC)

Processor	STM32F405RGT6 (168 MHz, 1 MB flash)
Gyroscope	BMI270 (SPI connection)
Barometer	BMP280 (see Chapter 6.1)
Blackbox memory	8 MB (manufacturer states “8MBp”)
Power supply	1S–2S Li-Po / LiHV (DC 2.9–8.7 V)
Voltage / current sensing	yes – scale 110 / 470
Mounting hole pattern	25.5 × 25.5 mm
Weight	4.8 g (without power lead)
Betaflight firmware target	CRAZYBEEF405
Serial ports	UART1, UART2 (onboard receiver), UART6

▶ 4-in-1 electronic speed controllers (ESC)

Power supply	1S–2S Li-Po / LiHV
Current	12 A continuous per motor, 15 A peak (3 s)
Firmware	BLHeli_S – Bluejay from the factory
ESC firmware target	Z-H-30
Default protocol	DShot300

▶ Onboard ExpressLRS receiver

Frequency band	2.4 GHz
Connection to FC	serial (UART2), CRSF protocol
Packet rate	25 / 50 / 150 / 250 / 500 Hz
Antenna	enameled copper wire, 31 mm long
Telemetry output power	< 12 dBm (manufacturer's figure)
Firmware target	HappyModel EP1/2 2400 RX

2.5 Manufacturer

Manufacturer	Quzhou Yunduan Intelligent Technology Co., Ltd. (Happymodel)
Address	No.3 North Fanggui RD, Qujiang District, Quzhou, 324002, Zhejiang, China
E-mail	info@happymodel.cn
Website	www.happymodel.cn

3. Legal conditions of operation in the Czech Republic and the EU

3.1 The law of the country of operation applies

Regulations (EU) 2019/947 and 2019/945 apply in all member states of the European Union, but the national implementing rules differ from state to state – registration portals, minimum pilot age, geographical zones, compulsory insurance, permitted frequency bands and maximum transmission power. The information in this chapter describes the situation in the Czech Republic. If you operate a drone with this board in another country, you must follow the regulations of the state in which you fly.

3.2 Radio frequencies and transmission power

The onboard ExpressLRS receiver operates in the **2.4 GHz** band and transmits telemetry back to the radio transmitter. The manufacturer states a telemetry output power of **less than 12 dBm**. Information on the maximum transmitted power according to the EU Declaration of Conformity can be requested from the importer (Chapter 8).

- In the Czech Republic, operation in the 2400–2483.5 MHz band is governed by the general authorisations of the Czech Telecommunication Office (VO-R/10 for short-range devices and VO-R/12 for wideband data transmission), which set the maximum permitted radiated power (e.i.r.p.).
- Use only the original antenna or an antenna specified by the manufacturer and do not add amplifiers.
- The user is responsible for the transmission power settings of the radio transmitter and the telemetry. Outside the Czech Republic, the limits of the respective country apply.

3.3 Use in a drone

The board itself is not an unmanned aircraft. The rules of Regulation (EU) 2019/947 apply to the drone you build with it. In the Czech Republic this means in particular:

- If the drone has a camera, the operator must **register** with the Civil Aviation Authority (ÚCL) regardless of the drone's weight and display the registration number on the drone.
- A privately built drone with a maximum take-off mass below 250 g and a speed below 19 m/s may be operated in subcategory A1, otherwise in subcategory A3.
- Fly up to a height of 120 m, within visual line of sight (VLOS) and never over assemblies of people. When flying with FPV goggles, an observer who watches the drone directly must stand next to the pilot.
- Respect geographical zones and privacy. We recommend liability insurance.

4. Installation and wiring

4.1 What else you need

- a frame for 25.5 × 25.5 mm mounting, four brushless motors with connectors matching the M1–M4 connectors, and propellers,
- a digital video transmitter with a camera and the corresponding cable,
- a 1S–2S Li-Po or LiHV battery with a connector matching the power lead,
- an ExpressLRS 2.4 GHz radio transmitter or transmitter module,
- a computer with Betaflight Configurator and a USB-C cable with data wires,
- a fine soldering iron, a multimeter and short-circuit protection (smoke stopper).

4.2 Mechanical installation

- Mount the board in the frame using the supplied rubber grommets (softmount) and the screws from the package. Do not overtighten the screws – the grommets are meant to dampen vibrations.
- Make sure the board does not touch the frame, carbon parts or metal parts.
- Route the receiver antenna (31 mm) as far as possible from carbon, metal and high-current wires. Do not shorten the antenna or bend it sharply.
- After installation, check on the *Setup* tab that the model on the screen tilts in the same way as the drone. If not, set the board orientation in Betaflight (*Configuration → Board and Sensor Alignment*).

4.3 Power supply

Solder the power lead with the XT30 connector to the **BAT+** and **GND** pads – observe the correct polarity. The board is designed for 1S–2S batteries. Always insert a **fully charged** battery before flight.

State	Li-Po 1S	LiHV 1S	Li-Po 2S	LiHV 2S
fully charged	4.20 V	4.35 V	8.40 V	8.70 V
end the flight	3.5 V	3.5 V	7.0 V	7.0 V
storage	3.8 V	3.8 V	7.6 V	7.6 V

Voltage per cell and for the whole 1S and 2S battery

4.4 Motors

Plug the motors into the **M1–M4** connectors on the bottom side of the board according to the diagram in Chapter 2.3. Check the motor order and direction of rotation in Betaflight on the *Motors* tab (without propellers). The direction of rotation can be changed in the ESC configurator (Chapter 5.5).

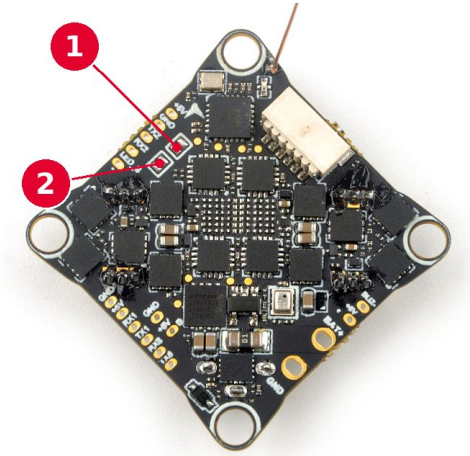
4.5 Digital video transmitter

Connect the digital video transmitter to the 6-pin connector (RX6(SBUS), GND, RX1, TX1, GND, BAT+). UART1 is factory-configured for the video transmitter (*VTX (MSP + DisplayPort)*), so the OSD is displayed in the goggles.

※ The BAT+ pin of the connector carries the battery voltage directly. Make sure your video transmitter can handle this voltage and check the cable wiring against the diagram – cables from different manufacturers differ.

4.6 Another receiver – freeing UART2

The onboard ELRS receiver is connected to the flight controller on **UART2** via two links next to the UART2 pads (see figure). If you want to connect another device or an external receiver to UART2, these links must be desoldered.



① onboard receiver TX link · ② onboard receiver RX link

※ UART2 is not freely available – desoldering the links frees it, but disconnects the onboard receiver. You modify the board at your own risk; this is not a product defect.

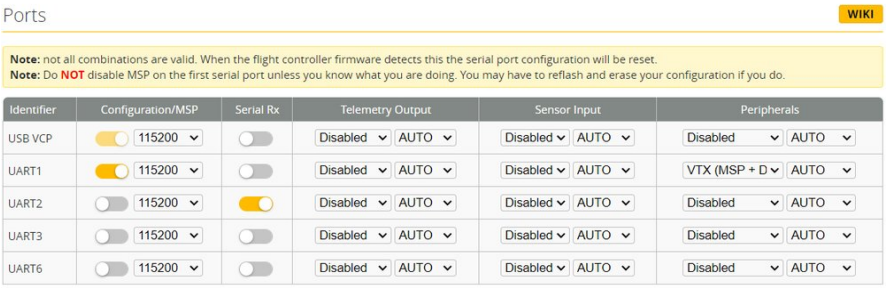
5. Configuration

5.1 Connecting to a computer

Connect the board to a computer with a USB-C cable and start **Betaflight Configurator**. A battery does not need to be connected for configuration via USB; however, the motors, video transmitter and other battery-powered devices will not work without it. Always keep the propellers removed.

Before making changes, save a backup of the default configuration – on the *CLI* tab with the **diff all** command, saving the output to a file.

5.2 Default port settings



Default Ports tab settings according to the manufacturer

- **UART1** – *Peripherals: VTX (MSP + DisplayPort)* for the digital video transmitter,
- **UART2** – *Serial Rx* for the onboard ELRS receiver,
- **UART6** – free.

On the *Receiver* tab, *Receiver Mode: Serial (via UART)* and the **CRSF** protocol must be selected.

5.3 Binding the ExpressLRS receiver

The transmitter module and the receiver must have the **same major version** of the ExpressLRS firmware (the first number of the version). Otherwise they will not bind by any method.

① **Binding phrase (recommended)** – set the same phrase on the transmitter module and in the receiver (ExpressLRS Configurator or the receiver's web interface). Binding then happens automatically.

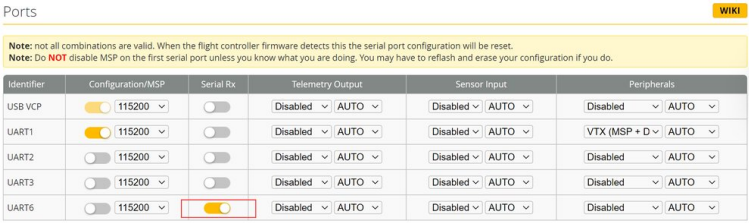
② **Manual binding** – put the receiver into bind mode (depending on the firmware version, e.g. by quickly connecting and disconnecting power three times, or with the *Bind Receiver* button on the *Receiver* tab in Betaflight). The receiver LED double-blinks quickly. Then select *[Bind]* in the ExpressLRS Lua script on the radio.

③ After binding, the receiver LED lights up solid. On the *Receiver* tab, check that stick and switch movements are displayed correctly.

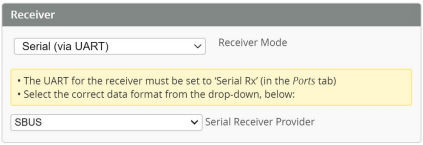
※ A receiver with a binding phrase set will not enter manual bind mode. Details can be found in the ExpressLRS documentation (Chapter 6.3).

5.4 DJI remote controller instead of the ELRS receiver

If you want to control the drone with a DJI remote controller via a DJI video transmitter, the manufacturer specifies these settings: the SBUS signal from the video transmitter is connected to the **RX6(SBUS)** pin of the 6-pin connector.



Port settings for a DJI remote controller: Serial Rx on UART6, UART2 disabled



Receiver tab: Serial (via UART), SBUS protocol

5.5 Electronic speed controllers (ESC)

- The ESCs come with **Bluejay** firmware from the factory (target Z-H-30); the default protocol is **DShot300**.
- ESC settings (direction of rotation, startup power, etc.) can be changed in a BLHeli_S / Bluejay configurator via the flight controller (passthrough).
- The manufacturer recommends: when using a 1S battery and high-KV 0702/0802 motors, set **startup power to 1100/1200**.

5.6 Voltage and current measurement

On the *Power & Battery* tab, check that the measured voltage matches the actual battery voltage (measure with a multimeter). The manufacturer specifies a *voltage meter scale* of **110** and a *current meter scale* of **470**. Set the low-voltage warning according to the table in Chapter 4.3.

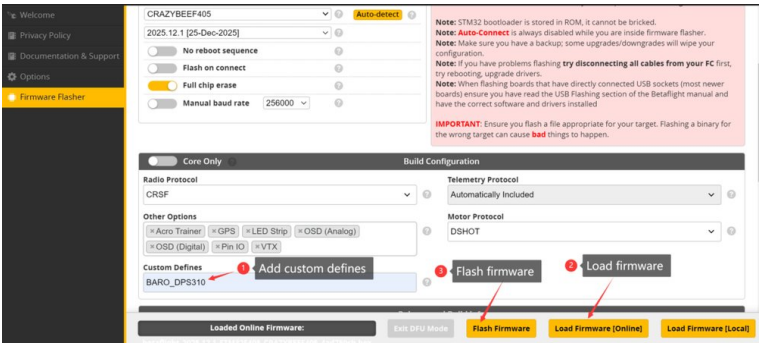
5.7 Arm, Disarm and failsafe

- On the *Modes* tab, assign the **Arm** function (motors on) to a switch on the radio. **Disarm** (motors off) is the opposite position of the same switch.
- On the *Failsafe* tab, set the reaction to signal loss so that the motors switch off safely (e.g. *Drop*).
- Test the failsafe **without propellers**: after Arm, switch off the radio – the motors must stop. Arm only with the drone on the ground and at a safe distance from people.

6. Firmware and further guides

6.1 Flight controller firmware

- The Betaflight firmware target is **CRAZYBEEF405**. Flash the firmware on the *Firmware Flasher* tab in Betaflight Configurator.
- The manufacturer points out: if you want to use the barometer after a firmware update, add the value **BARO_DPS310** to the *Custom Defines* field of the firmware build, and only then load the firmware online (*Load Firmware [Online]*) and flash it (*Flash Firmware*).
- If the board does not respond after a failed update, hold the **STM32F405 BOOT** button and connect USB – the board starts in DFU mode and the firmware can be flashed again.
- After the update, restore the configuration from the backup (Chapter 5.1).



Firmware Flasher: ① Custom Defines BARO_DPS310, ② Load Firmware [Online], ③ Flash Firmware

6.2 Receiver firmware

Update the firmware of the onboard receiver with **ExpressLRS Configurator** – target **HappyModel EP1/2 2400 RX** (via the receiver's Wi-Fi or via the flight controller). The **ESP8285 BOOT** element is used to recover the receiver firmware. Keep the transmitter module and the receiver on the same major version.

6.3 Further guides

Official documentation for the systems used:

- ExpressLRS – binding, configuration and firmware updates: www.expresslrs.org
- EdgeTX – radio transmitter firmware: www.edgetx.org
- Betaflight – flight controller firmware: www.betaflight.com

Manufacturer's website: www.happymodel.cn.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- After the flight, disconnect the battery and check the board, solder joints, cables and antenna.
- Remove dirt with a dry soft brush. Do not power a wet board until it has dried completely.
- Replace loose screws and worn grommets.
- Store the board in a dry place, out of the reach of children and in an antistatic bag. Store batteries at 3.8 V per cell.

7.2 Troubleshooting

Problem	Possible cause and solution
Computer does not detect the board	Charge-only USB cable – use a data cable; missing driver – install the drivers as prompted by Betaflight Configurator.
Receiver does not bind	Different ELRS major version in the transmitter module and receiver; different binding phrase – make them match (Chapter 5.3).
Receiver tab does not respond	Serial Rx is not enabled on UART2 or the protocol is not CRSF (Chapter 5.2).
Short signal range	Damaged or shielded antenna – route it away from carbon and metal; have a damaged one replaced.
No OSD in the goggles	UART1 is not set to VTX (MSP + DisplayPort); check the video transmitter cable.
Motor does not spin or stutters	Incorrect wiring or damaged motor; with 1S and 0702/0802 motors increase startup power (Chapter 5.5).
Motor spins the wrong way	Change the direction in the ESC configurator (Chapter 5.5).
Barometer does not work	Firmware built without BARO_DPS310 – see Chapter 6.1.
Board does not respond after an update	Connect in DFU mode with the STM32F405 BOOT button (Chapter 6.1).

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 (CrazyF405HD ELRS 1-2S AIO) is given on the product packaging and in this manual; the firmware version can be read in Betaflight Configurator after connecting the board to a computer.

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.