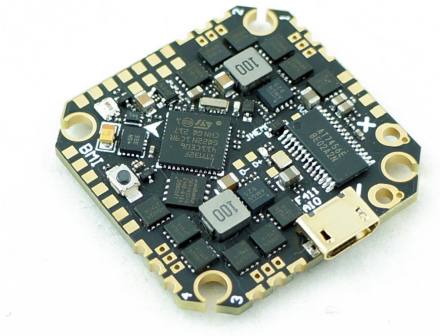
GHF411AIO BLS

JHEMCU · F411 flight controller (FC) with 4-in-1 BLHeli_S ESC

User manual



Read the safety instructions before installation. Never have propellers fitted while wiring, configuring or testing the motors.

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

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1. Safety instructions

1.1 Before you start

- The GHF411AIO board is a **component for building an FPV drone**. Installation, soldering and configuration require basic knowledge of electronics and of flight controller setup. If you are unsure, have the build done by an experienced person.
- The product is not a toy and is not intended for children. Keep small parts out of the reach of children.
- Before connecting anything for the first time, study the wiring diagram in Chapter 2.4 and connect each wire to the pad intended for it. Incorrect power wiring can permanently destroy the board and the connected devices.
- Protect the board from moisture, dust, metal debris and mechanical damage.

1.2 Soldering and installation

- Solder only with the battery and the USB cable disconnected.
- Use a temperature-controlled soldering iron and good-quality flux. Do not overheat the pads – heating them for too long or repeatedly can lift a pad off the board.
- After soldering, check that there are no short circuits (solder bridges) between adjacent pads and remove flux residue.
- Mount the board so that it does not touch the carbon frame – carbon fibre is electrically conductive. Route the wires so that they cannot get into the propellers and are neither stretched nor pinched.

1.3 Li-Po batteries

- Use only batteries within the range specified by the board manufacturer (Chapter 2.3). Always check the polarity before connecting.
- Charge Li-Po batteries only with a suitable charger, under supervision, on a non-flammable surface, and never leave them charging unattended.
- Do not continue to use a damaged, swollen or overheated battery.
- Disconnect the battery after the flight or when you have finished working.

1.4 Propellers and motor tests

- **Never have propellers fitted** while connected to a computer, configuring, calibrating or testing the motors in Betaflight.
- Fit the propellers only after checking the motor direction of rotation and the correct motor assignment (Chapter 4.4).
- Spinning propellers can cause serious injury. With the battery connected, approach the drone only in the Disarm state (motors off).

2. Product description

2.1 What the board is for

The JHEMCU GHF411AIO (version with BMI gyro, sold by Rotorama as **GHF411AIO BLS**) is an AIO (all-in-one) board combining a flight controller (FC) with an STM32F411 processor and a 4-in-1 electronic speed controller (ESC) with BLHeli_S firmware. Its M2 mounting holes with 25.5 × 25.5 mm spacing make it suitable mainly for toothpicks and smaller quadcopters.

The board has a built-in OSD, blackbox memory, 5 V and 10 V power supplies (BEC) and two serial ports (UART) for the receiver and the video transmitter. An external TVS diode for protection against voltage spikes is included; an external USB connector can also be connected to the board if required.

2.2 Package contents

Qty	Item
1×	GHF411AIO board (flight controller + 4-in-1 ESC)
1×	Accessory kit (includes a TVS diode)

Not included: battery, motors, propellers, receiver, video transmitter, camera or frame.

2.3 Specifications

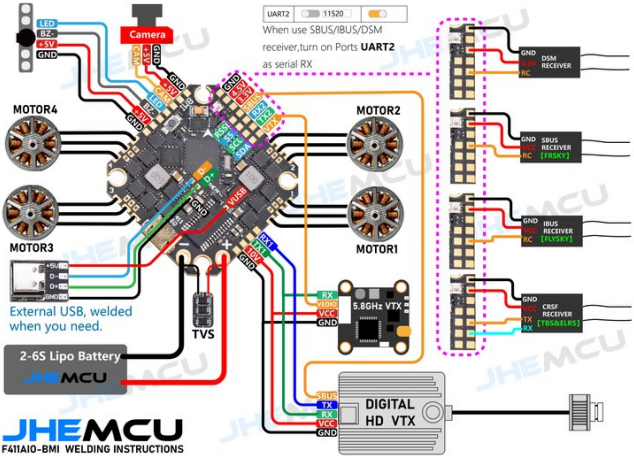
※ Data sources: Rotorama product page, the manufacturer's wiring diagram and configuration files for the GHF411AIO-BMI version. Data not stated by the manufacturer (e.g. operating temperature) are intentionally not included in this manual.

Parameter	Value
Manufacturer	JHEMCU (Shenzhen Jinhang Electronic Co., Ltd.)
Marking on the board	GHF411AIO BMI
Processor	STM32F411CEU
Gyro	BMI (according to the board marking)
Power supply	2–6S Li-Po (according to the manufacturer's wiring diagram)
Speed controller (ESC)	4-in-1, BLHeli_S, up to 40 A
BEC	5 V / 2.5 A; 10 V / 2 A
OSD	yes, AT7456E chip
Blackbox	8 MB memory
Serial ports	2 (UART1, UART2)
FC firmware	Betaflight, target **JHEF411**

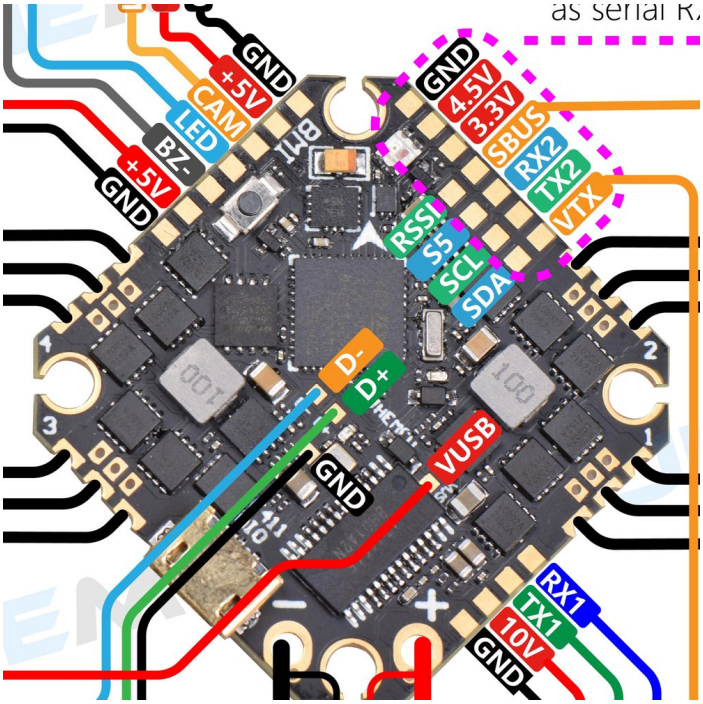
Parameter	Value
Dimensions	33 × 33 mm
Mounting holes	25.5 × 25.5 mm, M2
Weight	7.6 g

2.4 Wiring diagram and pad description

The following wiring diagram was published by the manufacturer for the GHF411AIO-BMI version. The meaning of the labels is explained in the table below the figure.



GHF411AIO-BMI wiring diagram (source: JHEMCU)



Board pads in detail (source: JHEMCU)

Pad	Function
+ / −	battery power input; the TVS diode is also connected here
1, 2, 3, 4 (corners)	outputs for motors M1–M4
GND, +5V, CAM	camera – 5 V supply and video signal from the camera
LED, BZ−, +5V, GND	addressable LED strip and buzzer
GND, 4.5V, 3.3V	receiver power supply
SBUS	SBUS receiver input
RX2, TX2	UART2 – serial receiver (CRSF/ELRS, IBUS, DSM)
VTX	video signal to an analogue video transmitter
RSSI, S5, SCL, SDA	analogue RSSI, fifth signal output (S5), I²C bus
10V, GND, TX1, RX1	10 V supply and UART1 for the video transmitter
D−, D+, VUSB, GND	external USB connector

3. Installation and wiring

3.1 Mechanical installation and orientation

- Fasten the board in the frame with M2 screws through the mounting holes with 25.5 × 25.5 mm spacing.
- The arrow printed on the top of the board indicates the forward flight direction. If you mount the board rotated, set the actual orientation in Betaflight (*Configuration* tab, *Board and Sensor Alignment*).
- The board corners are numbered 1–4 according to the motors connected to them.

3.2 Power supply and TVS diode

- Solder the power lead with the battery connector to the **+** and **−** pads at the bottom edge of the board. Check the polarity again before connecting the battery for the first time.
- Solder the TVS diode from the accessory kit to the **+** and **−** power pads according to the wiring diagram, as close to the board as possible. It protects the electronics from voltage spikes generated by the motors.
- Ideally, power up for the first time through a current limiter (smoke stopper), which prevents the board from being destroyed in the event of a short circuit.

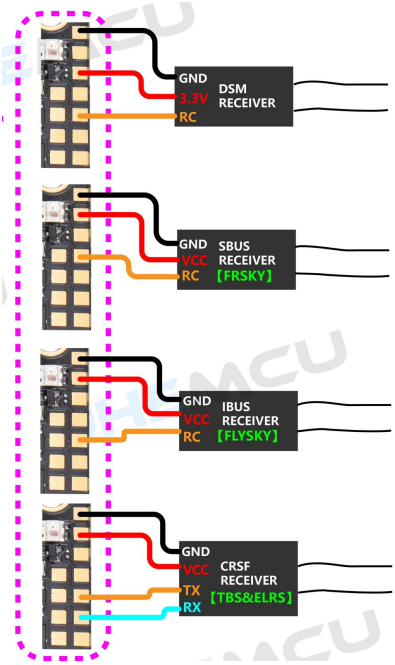
3.3 Motors

Solder the three wires of each motor to the three pads at the corresponding corner of the board (1–4). The order of the motor wires determines the direction of rotation; this can also be changed later in software (Chapter 5), so the motors do not need to be re-soldered.

3.4 Receiver

The receiver is connected to the GND pad, to power (4.5V; for a DSM receiver 3.3V according to the diagram) and to the signal pads according to the receiver type:

Receiver	Signal	Power
CRSF / ExpressLRS	receiver TX → RX2 receiver RX → TX2	4.5V and GND
SBUS (e.g. FrSky)	signal → SBUS	4.5V and GND
IBUS (FlySky)	signal → RX2	4.5V and GND
DSM	signal → RX2	3.3V and GND



Receiver connection according to the manufacturer (from top: DSM, SBUS, IBUS, CRSF)

※ Before connecting, check the permitted supply voltage in the receiver documentation. Receiver setup in Betaflight is described in Chapter 4.3.

3.5 Video transmitter and camera

▶ Analogue video transmitter

- transmitter VCC → **10V**, GND → **GND**,
- transmitter video input → **VTX**,
- transmitter control wire (RX) → **TX1**.
- Analogue camera: power **+5V** and **GND**, video signal → **CAM**.

▶ Digital video transmitter (HD)

- unit VCC → **10V**, GND → **GND**,
- unit TX → **RX1**, unit RX → **TX1**,
- unit SBUS wire (if fitted) → **SBUS** pad.

Before connecting the video transmitter, check in its documentation that it can be powered from 10 V. Never power on a video transmitter without an antenna connected.

3.6 LED, buzzer and external USB

- Addressable LED strip: data wire → **LED**, power **+5V** and **GND**.
- Buzzer: negative lead → **BZ−**, positive lead → **+5V**.
- External USB connector (e.g. routed to the frame): **VUSB**, **D−**, **D+** and **GND** to the identically labelled connector terminals. Connect it only if you need it – the board has its own USB connector.

4. Firmware and Betaflight setup

4.1 Connecting to a computer

The flight controller is configured in **Betaflight Configurator** (or in the web-based Betaflight App). Connect the board to the computer with a USB cable – the battery does not need to be connected for configuration. The propellers must be removed.

4.2 Flight controller firmware

- In Betaflight the board uses the target **JHEF411**, manufacturer **JHEF**.
- For the GHF411AIO-BMI version the manufacturer publishes a configuration file (CLI) and firmware in the repository github.com/jhemcu/FC-ESC-Firmware, folder *GHF411AIO-BMI*.
- If the board does not report the gyro and accelerometer after flashing, open the *CLI* tab, paste the entire content of the manufacturer's configuration file and confirm with Enter – according to the manufacturer, only this completes the firmware flashing.
- In the same repository the manufacturer also provides INAV firmware for the JHEMCUF411 target.

Before updating the firmware, save a backup of the current settings in the CLI tab with the command diff all.

4.3 Ports and receiver

- *Ports* tab: enable *Serial Rx* on **UART2**. According to the manufacturer this applies to CRSF/ELRS receivers as well as to SBUS, IBUS and DSM receivers.
- *Receiver* tab: select *Serial (via UART)* and the protocol matching the receiver (CRSF, SBUS, IBUS, Spektrum). The manufacturer's configuration file sets the CRSF protocol.
- Digital video transmitter on UART1: in the *Ports* tab set UART1 to *VTX (MSP + DisplayPort)*; for an analogue transmitter set its control protocol according to its documentation.
- After any change always click *Save and Reboot*.

4.4 Motors and DShot protocol

- The manufacturer's configuration file sets the **DShot600** protocol.
- Without propellers and with the battery connected, check in the *Motors* tab that each motor spins in the correct position and in the correct direction according to the *Quad X* layout.
- If the motor positions do not match, change their assignment (*Motor Remap*) rather than re-soldering the wires.

4.5 OSD and blackbox

The layout of the OSD elements (voltage, current, timers, warnings) is set in the *OSD* tab. Flight data are logged to the built-in 8 MB memory; it is managed in the *Blackbox* tab, where the memory can be downloaded and erased.

5. Electronic speed controllers (ESC)

- The 4-in-1 ESC runs **BLHeli_S** firmware. The manufacturer's firmware for this board is designated **G-H-30**.
- ESC settings (direction of rotation, startup, sounds) are made via the flight controller using an ESC configuration program with a BLHeli_S interface, e.g. the web-based ESC Configurator.
- For the GHF411AIO-BMI version the manufacturer also publishes **Bluejay** firmware for the same ESC type in the same repository. When flashing different firmware, always choose the variant matching the G-H-30 designation – wrong firmware can render the ESC inoperable.
- Flash ESC firmware only without propellers and with the board powered from the battery, not from USB.

6. Before the first flight

6.1 Build check

- All solder joints are solid, free of short circuits and flux residue.
- The accelerometer has been calibrated on a level surface (*Setup* tab, *Calibrate Accelerometer*) and the model in the preview tilts in the correct direction.
- The receiver is bound and the channels in the *Receiver* tab follow the stick movements.
- The position and direction of rotation of the motors have been checked (Chapter 4.4); only then fit the propellers.
- Insert a **fully charged** battery into the drone.

6.2 Arm, Disarm and failsafe

- In the *Modes* tab assign a switch for **Arm** (motors on) and check that switching to **Disarm** (motors off) stops the motors immediately.
- In the *Failsafe* tab check that the motors stop when the signal is lost (radio switched off). Perform this test without propellers.

6.3 Battery voltage

Monitor the battery voltage in the OSD. For Li-Po batteries:

State	Cell	2S	3S	4S	5S	6S
Fully charged	4.20 V	8.4 V	12.6 V	16.8 V	21.0 V	25.2 V
End the flight	3.5 V	7.0 V	10.5 V	14.0 V	17.5 V	21.0 V
Storage	3.8 V	7.6 V	11.4 V	15.2 V	19.0 V	22.8 V

6.4 Operating the finished drone

A drone built with this board is subject to the rules for unmanned aircraft systems – in the EU, Regulations (EU) 2019/947 and 2019/945. However, national implementing rules differ from country to country (registration, zones, insurance, frequencies and transmit power). **The law of the country in which you operate the drone always prevails.** Before flying, check the rules applicable at the flying location.

7. Maintenance and troubleshooting

- After a crash, check the board, the solder joints and the motor wires; replace damaged wires.
- Clean the board with a dry brush; moisture and dirt between the pads can cause a short circuit.
- Do not leave the battery connected when you are not working with the drone.

Problem	Possible cause and solution
The computer does not recognise the board	Try a different USB cable (it must carry data) and a different port; install the drivers offered by Betaflight.
Betaflight does not detect the gyro	Paste the manufacturer's configuration file for GHF411AIO-BMI in the CLI tab (Chapter 4.2).
No signal from the receiver	Check the TX/RX wiring (crossed), *Serial Rx* enabled on UART2 and the protocol selected in the *Receiver* tab.
A motor does not spin or stutters	Check the soldering of all three motor wires and the DShot protocol; check the ESC firmware.
A motor spins the wrong way	Change the direction of rotation in the ESC settings (Chapter 5).
OSD does not work	Check the camera (CAM) and transmitter (VTX) wiring and the settings in the *OSD* tab.

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 (GHF411AIO BMI) is printed on the underside of the board; the manufacturer also marks the board with “F411 AIO” and “BMI”.

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.