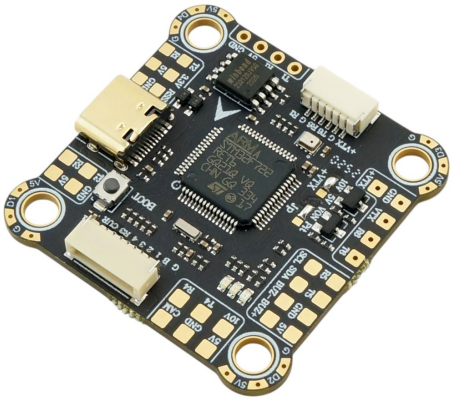
F722 HD Pro5

Skystars – flight controller (FC) 30.5 × 30.5 mm
User manual



Read the entire manual before installation and first power-up, in particular the safety instructions in Chapter 1. Keep this manual for future reference.

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1. Safety instructions

The flight controller (FC) is an electronic component intended for installation in an FPV drone. Installation requires soldering and basic knowledge of electronics. Incorrect wiring can permanently damage the board and the connected devices, and an incorrectly configured drone can cause injury or damage.

▶ Electrical safety

- Power the board only from a **3S to 6S Li-Po** battery. A higher voltage will destroy the board.
- Before connecting the battery, always check the polarity and use a multimeter to make sure there is no short circuit between the power supply and ground (GND).
- For the first power-up, use a current limiter (smoke stopper) or a laboratory power supply with current limiting.
- Solder only with the battery and the USB cable disconnected. Make sure that solder does not bridge adjacent pads.
- Do not connect devices with a higher current draw or a different supply voltage to the 5 V, 10 V and 3.3 V output pads than those they are intended for.
- Do not expose the board to moisture, water, dust from carbon frames or conductive contamination.

▶ Propellers and motors

- Keep the **propellers removed** during all configuration on the computer, during motor tests and while working on the drone.
- Spinning propellers can cause serious cuts. Keep a safe distance from a powered drone with propellers fitted – you, other people and animals.
- Assign the Arm function (motors enabled) to a dedicated switch on the transmitter and verify failsafe before the first flight (Chapter 5.1).

▶ Installation with regard to electromagnetic compatibility

- Keep the power leads from the battery to the ESC as short as possible and solder a low-ESR capacitor to the ESC power input as instructed by the ESC manufacturer.
- Route signal wires (receiver, GPS, video) as far as possible from power leads and motors.
- Mount the board on flexible dampers (softmount) so that it does not touch the carbon frame.
- Do not modify the board beyond the described solder pads and jumpers. Modifications may affect its function and electromagnetic compatibility.

2. Product description

2.1 What the board is for

The Skystars F722 HD Pro5 is a flight controller (FC) with an STM32F722 processor for FPV drones with a 30.5 × 30.5 mm mounting pattern. The fifth generation of the board uses an ICM42688P gyro, has 16 MB of blackbox memory, an integrated BMP280 barometer and two regulated supplies (BEC) of 5 V/3 A and 10 V/3 A.

The board has a connector for a digital video transmitter (DJI and compatible) as well as an OSD chip for analog video, so it suits drones with both digital and analog video. There are pads for LED strips in the corners. The power of the video transmitter (VTX) can be switched off with a switch on the transmitter – useful, for example, while waiting for a GPS fix, so that the VTX does not heat up unnecessarily.

2.2 Package contents

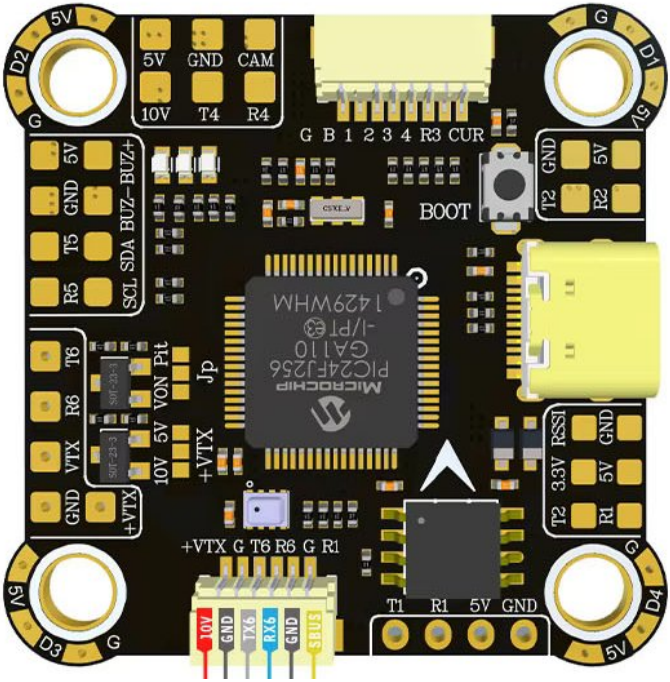
- 1× Skystars F722 HD Pro5 flight controller
- 1× accessory kit

Not included: electronic speed controller (ESC), motors, receiver, video transmitter, camera, GPS module, buzzer, LED strips, battery or USB cable.

2.3 Specifications

Parameter	Value
Input voltage	3–6S Li-Po
Processor	STM32F722RGT6
Gyro (IMU)	ICM42688P
Barometer	BMP280
Blackbox memory	16 MB
BEC	5 V / 3 A and 10 V / 3 A
UART	6 (UART1–UART6)
Motor outputs	4
I2C bus	yes (SCL, SDA)
Connectors	USB-C; ESC (8-pin); digital VTX (6-pin)
Mounting holes	30.5 × 30.5 mm, M3, softmount
Firmware	Betaflight – target **SKYSTARSF7HDPRO**; iNav is also supported (Chapter 7)
Weight and dimensions	not officially published by the manufacturer
Marking on the board	F7 HD PRO5

2.4 Top side

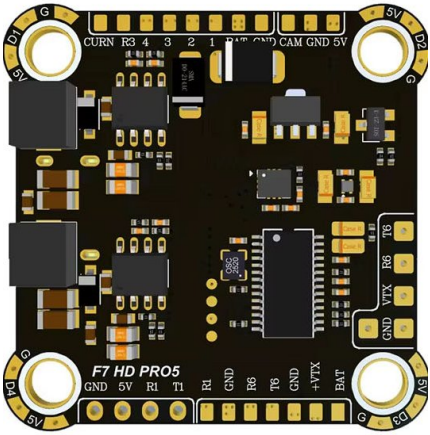


Top side of the board with pad labels (manufacturer's diagram; the processor is shown in simplified form)

Pad / element	Function
USB-C	connection to a computer (configuration, firmware)
BOOT	button for entering DFU mode (firmware flashing)
G B 1 2 3 4 R3 CUR	8-pin ESC connector: GND, battery power, motors 1–4, ESC telemetry (UART3 RX), current sensor
+VTX G T6 R6 G R1	6-pin digital VTX connector: VTX power, GND, UART6, GND, receiver input (UART1 RX)
T1 R1 5V GND	through-hole pads for the receiver (UART1)
GND 5V R1 / RSSI 3.3V T2	receiver pads: UART1 RX, UART2 TX, analog RSSI, 3.3 V output
GND 5V T2 R2	UART2
5V GND CAM / 10V T4 R4	camera: 5 V power, GND, video from the camera; 10 V output; UART4
5V GND T5 R5 / SCL SDA BUZ− BUZ+	GPS (UART5), compass (I2C), buzzer

Pad / element	Function
T6 R6 VTX GND +VTX	analog VTX: UART6, video to the VTX, GND, VTX power
Jp (10V 5V VON Pit)	solder jumpers for +VTX power (Chapter 3.8)
D1–D4 (5V, G)	LED strip pads in each corner

2.5 Bottom side



Bottom side of the board marked F7 HD PRO5 (manufacturer's diagram)

The bottom side carries the same signals as the top side: in the upper row CURN, R3, 4, 3, 2, 1, BAT, GND, CAM, GND, 5V; in the lower row GND, 5V, R1, T1 and R1, GND, R6, T6, GND, +VTX, BAT; on the right edge T6, R6, VTX and GND. The BAT pads are connected to the battery voltage.

※ Pads with the same label (e.g. R1) carry the same signal. Always connect only one device to one input.

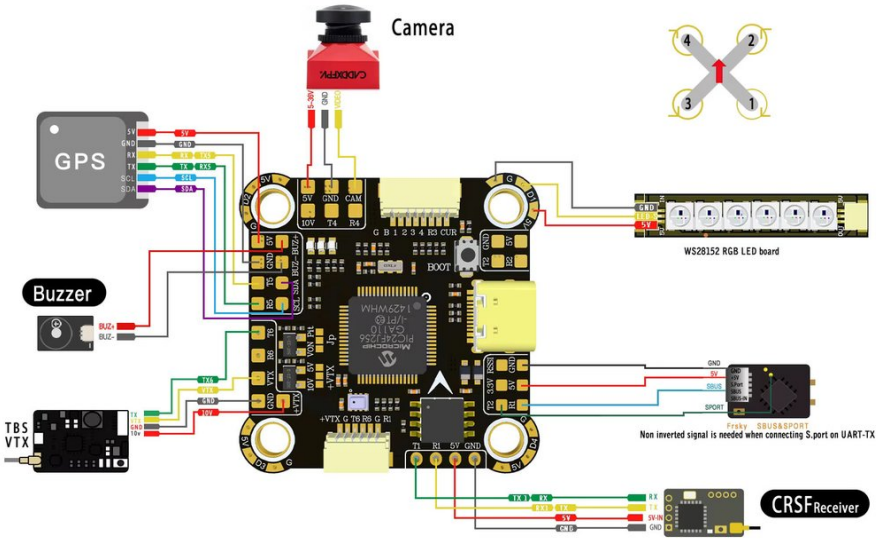
2.6 UART assignment

UART	Recommended use
UART1	receiver (receiver input by default)
UART2	free
UART3	ESC telemetry (R3 in the ESC connector)
UART4	free (e.g. camera control)
UART5	GPS
UART6	digital VTX (DJI) or analog VTX control

Port functions can be changed on the *Ports* tab in Betaflight (Chapter 4.3).

3. Installation and wiring

3.1 Wiring overview



Example peripheral wiring by the manufacturer: GPS and compass, buzzer, analog VTX, camera, LED strip, Frsky receiver (SBUS and S.Port) and CRSF receiver

The labels in the diagram are taken from the manufacturer. The wiring of the individual peripherals is described in detail in Chapters 3.3 to 3.7.

3.2 Mounting in the frame

① Insert silicone dampers (softmount) into the mounting holes.

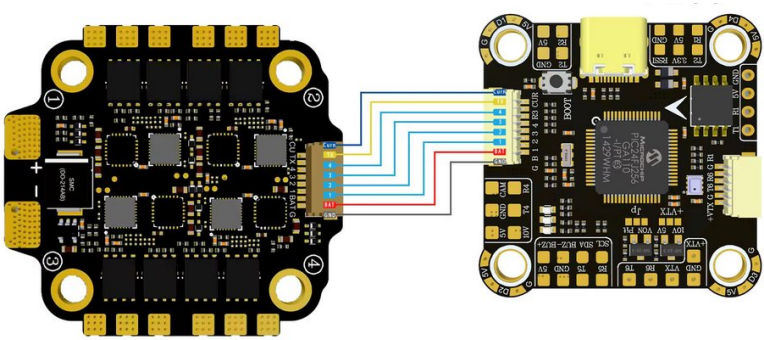
② Fit the board with the arrow on the top side pointing **in the direction of flight**. Any other orientation must be set in Betaflight (Chapter 4.5).

③ Tighten the board only so far that the dampers remain flexible. Overtightened dampers transmit vibrations.

④ Check that no component or solder joint touches the frame or the ESC board.

3.3 Connecting the ESC

A 4-in-1 ESC is connected to the flight controller with an 8-pin cable to the **G B 1 2 3 4 R3 CUR** connector: GND, battery voltage, motor signals 1–4, ESC telemetry and the current sensor signal. The connector also powers the board.



Connecting a 4-in-1 ESC to the flight controller with an 8-pin cable (manufacturer's diagram)

※ The wire order in the ESC connector differs between manufacturers. Before connecting, compare the pad labels on the ESC with those on the FC. If they do not match, rearrange the wires in the connector or solder the wires directly to the pads on the bottom side of the board.

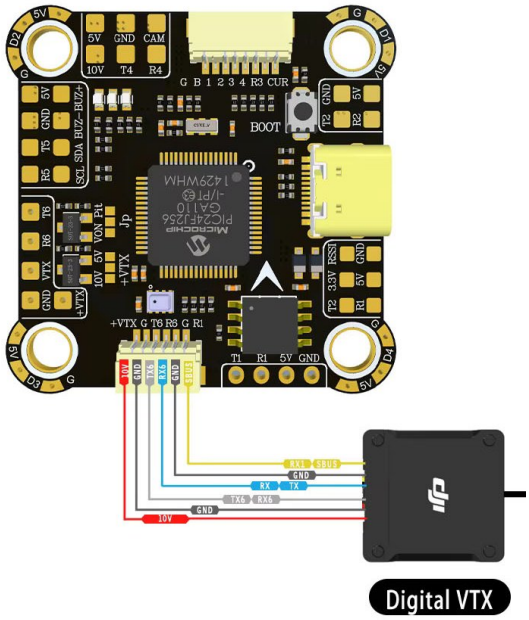
3.4 Receiver

The receiver is connected to **UART1**.

- **CRSF / ExpressLRS receiver:** receiver TX → R1, receiver RX → T1, 5V → 5V, GND → GND (through-hole pads T1 R1 5V GND).
- **SBUS receiver (e.g. Frsky):** SBUS → R1, 5V and GND power. Connect S.Port telemetry to T2; according to the manufacturer, a non-inverted signal is required when connecting S.Port to a UART TX pin.
- According to the manufacturer, the receiver can also be connected to another free UART; set the port and protocol in Betaflight accordingly (Chapters 4.3 and 4.4).

3.5 Digital video transmitter (DJI and others)

A digital VTX is connected with a cable to the 6-pin **+VTX G T6 R6 G R1** connector: VTX power (10 V in the manufacturer's diagram), GND, UART6 (TX6 → unit RX, RX6 ← unit TX), GND and the SBUS wire from the unit to R1. Use the SBUS wire only if the digital system serves as the receiver; otherwise remove it from the cable so that it does not interfere with another receiver on UART1.



Connecting a digital VTX with a 6-pin cable (manufacturer's diagram)

※ Compare the wire order in the cable with the connector on the VTX. Before connecting the VTX for the first time, measure the voltage on the +VTX pad (Chapter 3.8).

3.6 Analog camera and VTX

- **Camera:** camera power → 5V, GND → GND, camera video output → CAM. Check that the camera accepts a 5 V supply.
- **Analog VTX:** VTX video input → VTX, GND → GND, VTX power → +VTX, VTX control (SmartAudio / IRC Tramp) → T6.
- Check that the VTX supply voltage matches the voltage on the +VTX pad (Chapter 3.8).

3.7 GPS, compass, buzzer and LEDs

- **GPS:** 5V → 5V, GND → GND, module TX → R5, module RX → T5.
- **Compass (magnetometer) in the GPS module:** SCL → SCL, SDA → SDA.
- **Buzzer:** + → BUZ+, − → BUZ−.
- **LED strip** (WS2812-type addressable LEDs): data input → Dx, 5V → 5V, GND → G. Pads D1–D4 are in the corners of the board; the manufacturer's diagram uses D1.

3.8 VTX power and Jp jumpers

The video transmitter power is routed to the **+VTX** pads and to the digital VTX connector. Next to the +VTX pads there is a group of **Jp** solder jumpers labelled 10V / 5V and VON / Pit. The manufacturer does not describe their configuration in detail; the wiring diagram shows 10 V on +VTX.

- Do not change the factory setting of the jumpers unless you know exactly what they do.
- Before connecting the VTX for the first time, connect a battery to the board (through a current limiter) and **measure the voltage** between +VTX and GND with a multimeter. The voltage must match the permitted supply voltage of your VTX.
- Switching the VTX power with a switch on the transmitter is set up in Betaflight (Chapter 4.8).

4. Setup in Betaflight

Carry out all steps in this chapter **without propellers**. Menu paths are given as they appear in Betaflight Configurator.

4.1 Connecting to a computer

① Install Betaflight Configurator (app.betaflight.com or the installable version from betaflight.com).

② Connect the board to the computer with a USB-C cable that carries data (not a charge-only cable).

③ Click *Connect*. If the board does not connect, install the driver according to the Betaflight documentation and try another cable or port.

When powered from USB only, devices supplied from the battery voltage or from the 10 V BEC may not work. To test the receiver, VTX and motors, connect a battery (without propellers).

4.2 Firmware and target

According to the manufacturer, the Betaflight firmware target for this board is **SKYSTARSF7HDPRO**. Always back up your settings before changing the firmware (Chapter 7). When flashing firmware, select only this target – firmware for another board may render the board inoperable.

4.3 Ports



Recommended settings of the Ports tab according to the manufacturer

- UART1: *Serial Rx* enabled (receiver).
- UART3: *Sensor Input* → *ESC* (ESC telemetry, if the ESC supports it).
- UART5: *Sensor Input* → *GPS*.
- UART6: when using a DJI digital unit, enable *Configuration/MSP*; with an analog VTX, select the VTX protocol under *Peripherals* (e.g. *VTX (TBS SmartAudio)*).
- UART4: optionally *Peripherals* → camera control.

Save the settings with *Save and Reboot*. Always keep MSP enabled on the USB port (USB VCP), otherwise you will not be able to connect to the board.

4.4 Receiver and channels

① On the *Receiver* tab, select *Serial (via UART)* and the protocol of your receiver (CRSF for ExpressLRS and Crossfire, SBUS etc.).

② Bind the receiver to the transmitter according to the receiver manual.

③ Check that stick movements correspond to the channels (Roll, Pitch, Yaw, Throttle) and that the range is approximately 1000–2000. Correct the channel order in *Channel Map*.

④ On the *Modes* tab, assign the *ARM* mode to a dedicated two-position switch.

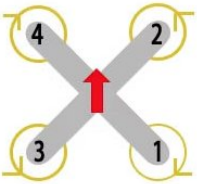
4.5 Accelerometer and orientation

① On the *Setup* tab, check that the drone model on the screen moves in the same way as the real drone.

② If the board is not mounted with the arrow pointing forward, set the rotation on the *Configuration* tab under *Board and Sensor Alignment*.

③ Place the drone on a level surface and click *Calibrate Accelerometer*.

4.6 Motors



The manufacturer uses the standard Betaflight motor order (top view, arrow = direction of flight): **1** rear right, **2** front right, **3** rear left, **4** front left.

① On the *Configuration* tab, select the ESC protocol (DShot) according to the capabilities of your ESC.

② On the *Motors* tab, confirm that the propellers are removed and spin up the motors one at a time. Check their order and direction of rotation according to the selected *Motor direction* setting.

③ Correct a wrong order with the *Reorder motors* function and a wrong direction of rotation with the *Motor direction* function or in the ESC configuration.

4.7 Voltage and current

The board measures the battery voltage itself. Current is measured by a sensor in the ESC whose signal arrives via the CUR wire. Set the current sensor scale (*Scale*) on the *Power & Battery* tab according to the data of your ESC manufacturer. For the Skystars KO60II ESC, the manufacturer's diagram gives Scale 68 and Offset 0.



Current meter settings in Betaflight for the Skystars KO60II ESC (manufacturer's diagram)

Verify the scale after a flight: the capacity consumed according to the OSD should match the capacity the charger puts back into the battery.

4.8 Switching VTX power

The VTX power is switched by a PINIO output of the flight controller. In Betaflight it is controlled by a *USER* mode on the *Modes* tab – assign a switch on the transmitter to it. You can check which USER mode controls the switch with the CLI command *get pinio_box*. Before take-off, always check that the VTX is on and the image is in the goggles.

4.9 OSD, barometer and blackbox

- **OSD:** with analog video, configure the elements on the *OSD* tab. With digital systems, the OSD is transmitted via UART6 (MSP).
- **The BMP280 barometer** measures altitude (e.g. in the OSD or in iNav firmware). Do not cover the barometer and protect it from direct airflow, for example with a piece of open-cell foam.
- **Blackbox:** flight data are recorded in the built-in 16 MB memory. It is configured on the *Blackbox* tab, where the memory can also be erased and the log downloaded.

5. Operation

5.1 Arm, Disarm and failsafe

- Control **Arm** (motors enabled) and **Disarm** (motors disabled) with a dedicated switch. Arm only with the throttle at minimum and the drone on the ground.
- Betaflight will not allow arming if it detects an obstacle (e.g. USB connected, throttle above minimum, tilt). The reason is shown on the *Setup* tab or in the OSD.
- **Failsafe:** set the behaviour on signal loss on the *Failsafe* tab. Test the function without propellers: arm the drone, switch off the transmitter and check that the motors stop.

5.2 Batteries

The board is designed for **3S to 6S** batteries. Always insert a **fully charged** battery before a flight. Observe the following voltages:

Li-Po	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

- Set the low-voltage warning on the *Power & Battery* tab and show the voltage in the OSD.
- Charge Li-Po batteries only with a balancing charger, under supervision and on a non-flammable surface. Do not use a damaged or swollen battery.
- Disconnect the battery after the flight. Never leave the drone unattended with a battery connected.

5.3 Pre-flight check

- The battery is **fully charged** and securely attached.
- The propellers are undamaged, correctly fitted and tightened.
- No wire reaches into the propellers; neither the board nor the connectors are loose.
- The link to the transmitter works, the Arm switch is in the Disarm position and failsafe has been verified.
- The VTX is on and the image in the goggles is fine.

5.4 Legal operation of the finished drone

The flight controller itself is not a drone. A drone you build with it is a **privately built unmanned aircraft system** under Regulation (EU) 2019/947, and its operation is governed by this regulation and by national rules. The regulation applies 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. **The law of the country in which you fly always prevails.**

- In the Czech Republic and in the other EU Member States, the operator of a drone with a camera must register (in the Czech Republic with the Civil Aviation Authority) and display the registration number on the drone.
- The pilot must have the competence required for the category of operation and observe the operational limits (as a rule at most 120 m above ground and within visual line of sight).
- When flying with FPV goggles, an observer who watches the drone directly must be present next to the pilot.
- The user is responsible for the transmit power settings of the receiver and the video transmitter; observe the limits applicable in the country of operation.

6. Maintenance and troubleshooting

6.1 Maintenance

- After a crash, check the solder joints, connectors, dampers and wires. A loose wire can cause a short circuit.
- Clean the board with a dry brush or compressed air. After contact with water, disconnect the battery and let the board dry thoroughly.
- Store the drone with the board in a dry place, without a battery connected and out of the reach of children.

6.2 Troubleshooting

Problem	Possible cause and solution
The computer does not detect the board	Charge-only cable – use a data cable. Missing driver – install it according to the Betaflight documentation. Try another USB port.
Firmware cannot be flashed	Put the board into DFU mode: hold the BOOT button and connect the USB cable. Select the SKYSTARSF7HDPRO target.
The receiver does not respond	Check the TX/RX wiring (crossed), *Serial Rx* enabled on the correct UART, the protocol on the *Receiver* tab and the binding.
The drone cannot be armed	Find the reason on the *Setup* tab or in the OSD (arming disable flags). Common causes: throttle not at minimum, USB connected, accelerometer not calibrated.
Motors spin incorrectly	Check the order and direction (Chapter 4.6) and the board orientation (Chapter 4.5).
No image from the VTX	Check the VTX power switch (Chapter 4.8), the voltage on +VTX (Chapter 3.8) and the video signal wiring.
No OSD with a digital VTX	Enable *Configuration/MSP* on UART6 and check the TX6 / RX6 wires.
Measured current is wrong	Adjust the *Scale* on the *Power & Battery* tab according to the ESC manufacturer (Chapter 4.7).

7. Firmware updates and further resources

- Back up your settings before a firmware update: enter *diff all* in the CLI and save the output to a file.
- Flash the firmware on the *Firmware Flasher* tab in Betaflight Configurator, target **SKYSTARSF7HDPRO**. If the board does not switch to flashing mode by itself, hold the BOOT button while connecting the USB cable.
- After flashing, restore the settings from the backup only if it comes from the same major firmware version. Otherwise, set up the board again according to Chapter 4.
- **iNav:** the board is also supported by iNav firmware. Target names differ between sources; before flashing, check in the target list of iNav Configurator that you are selecting the target for the Skystars F722HD Pro board. If in doubt, contact the importer.

▶ Official firmware documentation

- Betaflight: www.betaflight.com
- iNav: github.com/iNavFlight/inav
- Manufacturer: www.skystars-rc.com

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 (F7 HD PRO5) is printed on the underside of the board; the trade name is Skystars F722 HD Pro5.

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.