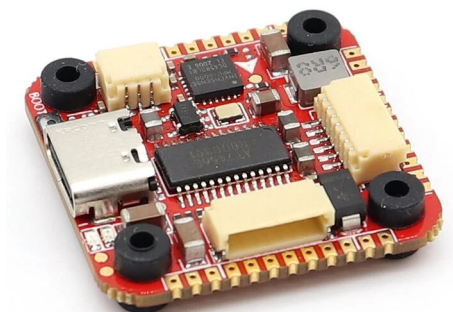




Exceed F405

ATOMRC · Flight controller (FC) 20 × 20 mm
User manual



Read this entire manual before installation and before connecting a battery for the first time. Always remove the propellers when configuring and testing motors.

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

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1. Safety instructions

1.1 Before you start

The ATOMRC Exceed F405 flight controller (FC) is an electronic component intended to be built into an FPV drone or another radio-controlled model. Installation requires soldering and configuration on a computer; if you are not experienced with this, ask an experienced modeller for help.

- Read this entire manual and the wiring diagram in Chapter 4 before installation.
- This product is not a toy and must be kept away from children.
- Do not work on the board or on connected components while a battery is connected.
- Do not continue to use a faulty, mechanically damaged or overheated board.

1.2 Soldering and handling electronics

- Always disconnect the battery and the USB cable before soldering.
- Protect the board from static electricity – touch a grounded object before handling and hold the board by its edges.
- Solder quickly and cleanly, without excess solder. Cold joints and solder bridges between adjacent pads are the most common cause of faults.
- After soldering, use a multimeter to check that there is no short circuit between the power input (VCC) and ground (GND).
- We recommend using a current-limiting protection device (a so-called smoke stopper) when connecting the battery for the first time.
- Observe the correct power polarity – reverse polarity will permanently damage the board.

1.3 Li-Po batteries and power supply

The flight controller is powered from a **3S to 6S** battery via the electronic speed controller (ESC). Never connect a battery with a higher cell count.

Battery state	per cell	3S	4S	5S	6S
Fully charged (Li-Po)	4.20 V	12.6 V	16.8 V	21.0 V	25.2 V
Fully charged (LiHV)	4.35 V	13.05 V	17.4 V	21.75 V	26.1 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

- Always insert a **fully charged** battery before flight.
- Charge batteries only with a charger designed for the cell type, under supervision and on a non-flammable surface.
- Do not use a damaged, swollen or overheated battery.
- Always disconnect the battery after use.

1.4 Configuring and testing motors

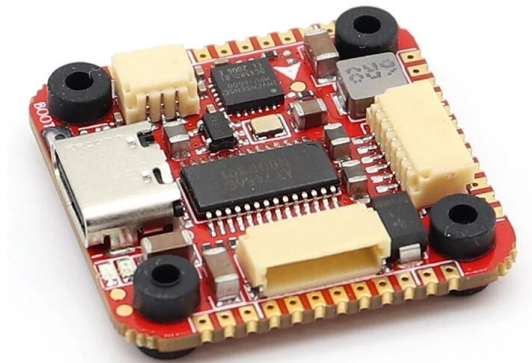
Always remove the propellers whenever you configure, update firmware or test motors. The motors may start spinning unexpectedly.

Always treat a drone with a connected battery as live. Test the Arm function (motors enabled) only after checking the complete setup according to Chapter 5.

2. Product description

2.1 Intended use

The Exceed F405 is a flight controller (FC) for stacks with 20 × 20 mm mounting hole spacing. It features an STM32F405 processor, integrated OSD, 16 MB of blackbox memory, five serial ports (UART), six motor outputs and two voltage regulators (BEC), 3.3 V and 5 V, for powering other components. It connects to a computer via a USB-C connector.



ATOMRC Exceed F405 – top view

2.2 Package contents

- 1× ATOMRC Exceed F405 flight controller
- 4× silicone damper (soft mount)
- 1× JST 1.0 mm 3-pin cable for the receiver
- 1× JST 1.0 mm 6-pin cable for the ESC
- 1× JST 1.0 mm – 1.25 mm 7-pin cable for the camera and video transmitter (VTX)

Not included: ESC, receiver, camera, video transmitter, GPS module, LED strip, buzzer and battery.

2.3 Specifications

Parameter	Value
Processor (MCU)	STM32F405, 168 MHz
Gyroscope / accelerometer	MPU6000 (SPI) – version V1; BMI270 – version V2 (see 2.4)
OSD	integrated, Betaflight OSD
Blackbox memory	16 MB
Serial ports (UART)	5
PWM / DShot motor outputs	6
Input voltage	3–6S Li-Po
BEC	3.3 V / 1 A and 5 V / 3 A
SBUS inverter	built-in (UART2)
VTX control	SmartAudio, Tramp
WS2812 LED strip / buzzer / RSSI	yes / yes / yes
USB connector	USB-C
Mounting holes	20 × 20 mm, M2 / M3
Weight	4.5 g
Betaflight firmware target	ATOMRCF405

2.4 Board hardware versions

The manufacturer has supplied the Exceed F405 in several hardware versions. The original version (V1, marked e.g. **V1.1** on the underside of the board) is fitted with an **MPU6000** gyroscope, the newer version **V2** with a **BMI270** gyroscope. You can identify the version by the print on the underside of the board or by the marking on the gyroscope chip.

The wiring diagram in Chapter 4 comes from the manufacturer and shows version V1. The pad layout of version V2 may differ – always follow the labels printed directly on the board.

3. Legal conditions of operation

3.1 The law of the country in which you fly applies

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

3.2 A drone built with this flight controller

The flight controller on its own is not a drone. However, a drone you build with it is an unmanned aircraft and its operation is governed by Regulation (EU) 2019/947. A self-built drone has no C0–C4 class marking, so in the open category it can be operated as a privately built unmanned aircraft system – in subcategory **A1** if its take-off mass is less than 250 g, otherwise in subcategory **A3** – or within a model aircraft club or association.

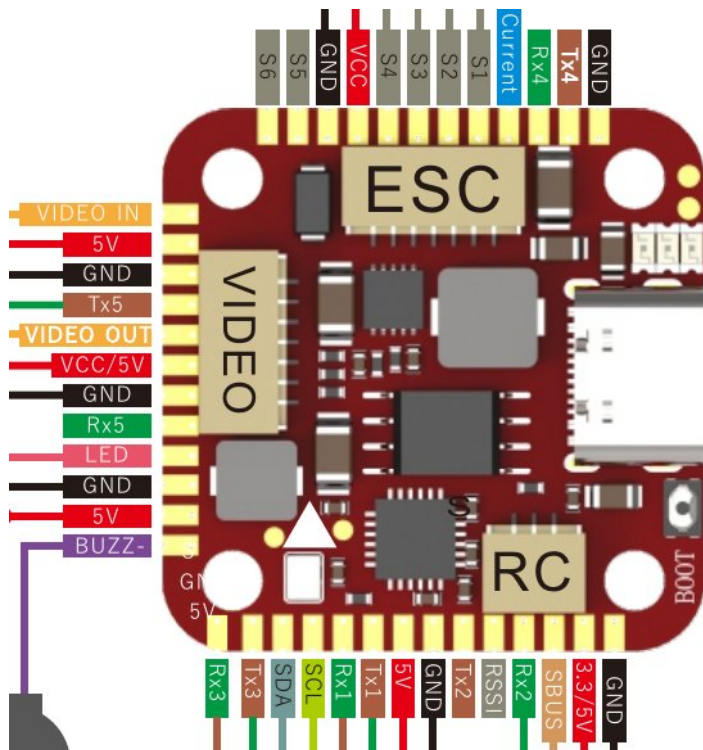
- If the drone has a camera, the operator must **register** regardless of the drone's weight and display the registration number on the drone.
- Do not fly higher than 120 m above ground, keep the drone in visual line of sight (VLOS) and do not fly over assemblies of people. In subcategory A3, keep a distance of 150 m from residential, commercial, industrial and recreational areas.
- When flying with FPV goggles, an observer must stand next to the pilot and watch the drone directly.
- Set the transmitting power of the receiver and video transmitter in accordance with the regulations of the country of operation – the user is responsible for these settings.
- Respect the privacy of others. We strongly recommend liability insurance.

Always actually weigh the take-off mass of the finished drone, including the battery and accessories.

4. Wiring

4.1 Pads and connectors

The top side of the board carries three connectors – **ESC**, **VIDEO** and **RC** – and the **BOOT** button. Solder pads run around the edge of the board. The white arrow on the board indicates the direction of flight.



Pad layout (top side, version V1) – according to the manufacturer's diagram

Group	Pads	Purpose
ESC	S1, S2, S3, S4	motor 1–4 signals
	S5, S6	additional outputs (motors, servos)
	VCC, GND	FC power from the battery via the ESC
	Current	ESC current sensor input
	Rx4, Tx4	UART4
VIDEO	VIDEO IN, 5V, GND	camera
	VIDEO OUT, VCC/5V, GND	video transmitter (VTX)
	Tx5, Rx5	UART5 – VTX control
	LED, 5V, GND	WS2812 LED strip
	BUZZ-, 5V	buzzer
RC and bottom row	SBUS, 3.3/5V, GND	SBUS receiver (inverter to UART2)
	Rx2, Tx2	UART2
	Rx1, Tx1	UART1 (e.g. CRSF/ELRS receiver)
	Rx3, Tx3	UART3 (e.g. GPS)
	SDA, SCL	I ² C bus (e.g. compass)
	RSSI	analogue RSSI input
	5V, GND	5 V power for peripherals

❖ **The pad labels on the board always take precedence over this overview.**

4.2 Electronic speed controller (ESC)

Connect the ESC with a cable to the **ESC** connector, or solder the wires to the pads. Outputs S1 to S4 correspond to motors 1 to 4 in the configurator.

ESC cables from different manufacturers use different wire orders. Compare the order at both ends of the cable before connecting - a swapped power wire will destroy the board.

4.3 Camera and video transmitter (VTX)

- **Camera:** VIDEO IN, 5V, GND.
- **Video transmitter:** VIDEO OUT, VCC/5V, GND. Connect the VTX control wire (SmartAudio or Tramp) to Tx5 according to the manufacturer's diagram.
- Before connecting the VTX, measure the voltage on the VCC/5V pad with a multimeter and make sure it matches the supply range of your video transmitter.

4.4 Receiver

- **SBUS** (e.g. FrSky): SBUS signal to the SBUS pad, power to 3.3/5V and GND.
- **Spektrum:** signal to Rx2, power to 3.3/5V and GND.
- **CRSF / ExpressLRS** (e.g. TBS): signal wires to UART1 – receiver TX output to Rx1, receiver RX input to Tx1; power to 5V and GND.

Measure the voltage on the 3.3/5V pad before connecting the receiver. A receiver designed for 3.3 V will be destroyed by 5 V.

4.5 GPS module

Connect the GPS module to UART3: module TX output to Rx3, module RX input to Tx3, power to 5V and GND. If the module has a compass, connect its wires to SDA and SCL.

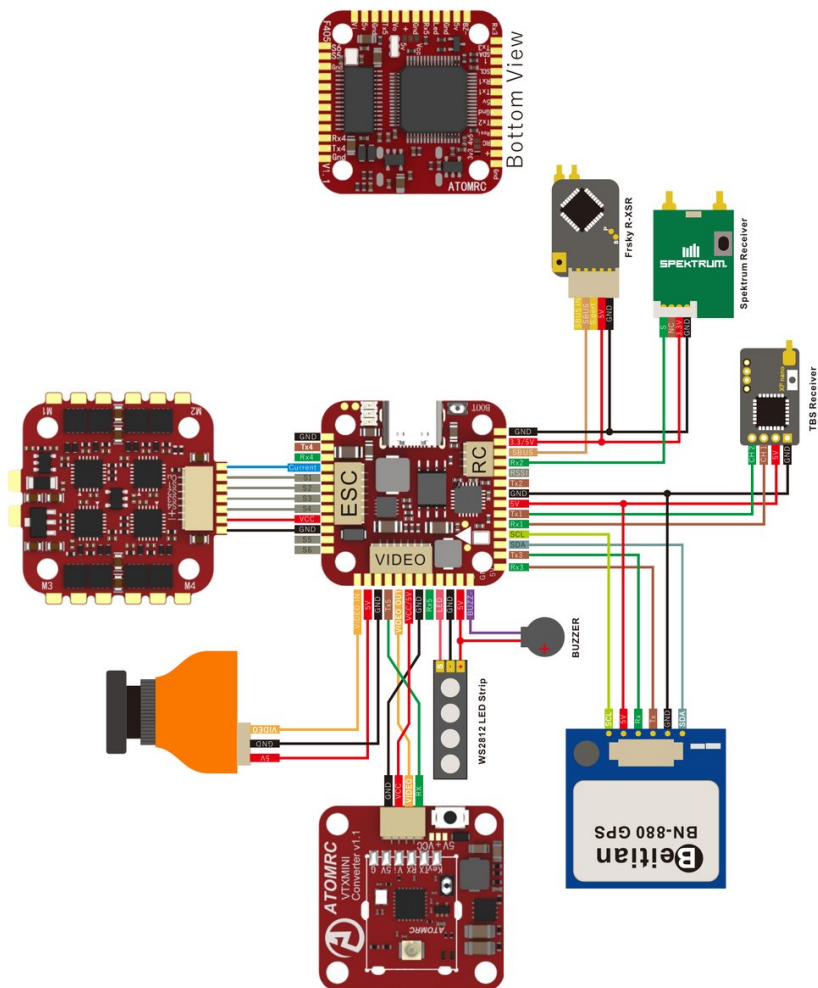
4.6 LED strip and buzzer

- **WS2812 LED strip:** signal (S) to LED, “+” to 5V, “–” to GND.
- **Buzzer:** “+” to 5V, “–” to BUZZ-.

4.7 Mounting in the frame

- Insert the supplied silicone dampers into the mounting holes – they reduce the transmission of vibration to the gyroscope.
- Orient the board with the arrow in the direction of flight. If you mount it differently, set the board rotation in the configurator (*Board and Sensor Alignment*).
- Tighten the screws only lightly so that the dampers are not fully compressed.

- Route the cables so that they do not pull on the connectors and cannot touch the propellers.



Manufacturer's wiring diagram (version V1) – rotated by 90°

5. Setup

5.1 Connecting to a computer

Connect the board to a computer with a USB-C cable (not included) and start **Betaflight Configurator** (or INAV Configurator if the board runs INAV). If the computer does not recognise the board, install the STM32 virtual COM port driver and try a different USB data cable.

5.2 Firmware and target

The manufacturer specifies the Betaflight target **ATOMRCF405**. For hardware version V2, the target **ATOMRCF405V2** is available in INAV firmware. After connecting the board, note the name of the target the board was supplied with in the configurator, and always use the same target when updating.

Before making any changes, back up your settings in the *CLI* tab with the *diff all* command and save the output to a file.

5.3 Port configuration

In the *Ports* tab, assign functions to the serial ports according to where you connected the peripherals:

- receiver port (UART1, or UART2 – also when wired to the SBUS pad) – *Serial Rx*,
- UART3 with the GPS module – *GPS*,
- UART5 with the video transmitter – *VTX (TBS SmartAudio)* or *VTX (IRC Tramp)*.

5.4 Receiver

In the *Receiver* tab, select the receiver protocol (e.g. CRSF, SBUS or Spektrum). Bind the receiver to your radio according to its manual and check that stick movements correspond to the correct channels. Adjust the channel map if necessary.

5.5 Orientation and accelerometer calibration

In the *Setup* tab, tilt the drone and check that the model on the screen moves the same way. Then place the drone on a level surface and run *Calibrate Accelerometer*.

5.6 Motor check

The propellers must be removed!

In the *Configuration* tab, select the ESC protocol (e.g. DShot). Connect the battery and spin up the motors one at a time in the *Motors* tab. Check that the motor order matches the diagram in the configurator and that each motor spins in the correct direction.

5.7 Arm, Disarm and failsafe

In the *Modes* tab, assign **Arm** (motors enabled) and **Disarm** (motors disabled) to a switch on your radio. Then test failsafe without propellers: after switching off the radio, the motors must stop within a few seconds.

5.8 OSD and blackbox

The on-screen layout is set in the *OSD* tab. Flight data (blackbox) is logged to the built-in 16 MB memory; in the *Blackbox* tab you can download the log and erase the memory when it is full.

6. Firmware update

- ① Back up your settings with the *diff all* command in the *CLI* tab.
- ② Open the *Firmware Flasher* in the configurator and select the board target (see 5.2).
- ③ If the board does not enter flashing mode by itself, disconnect it, press and hold the **BOOT** button, connect the USB cable and release the button. The board is then in DFU mode.
- ④ Flash the firmware with the *Full chip erase* option and wait for it to finish. Do not disconnect the cable during flashing.
- ⑤ Reconnect the board and restore your settings. Do not paste a backup from a different firmware version blindly – review it and paste only valid commands.

Keep the battery disconnected and the propellers removed while flashing firmware.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- After a crash, check the solder joints, connectors and cables, and test the board again without propellers.
- Protect the board from moisture, dust and metal debris that could cause a short circuit.
- Do not power a wet board – let it dry thoroughly.
- Store in a dry place at room temperature, out of the reach of children.

7.2 Troubleshooting

Problem	Possible cause and solution
Computer does not recognise the board	USB data cable, STM32 VCP driver; try another USB port.
Firmware cannot be flashed	Put the board into DFU mode with the BOOT button (Chapter 6).
Receiver does not respond	Receiver power, swapped Tx/Rx, Serial Rx port and protocol in the Receiver tab.
SBUS receiver does not work	The signal must be on the SBUS pad, not on Rx2; UART2 set as Serial Rx.
Motors do not spin	ESC protocol, ESC cable and its wire order.
Wrong motor order or direction	Remap the motors and change the spin direction in the ESC settings.
VTX cannot be controlled	UART5 port in the Ports tab, control wire connected to Tx5.
Model in the configurator tilts differently	Set the board rotation (Board and Sensor Alignment).
GPS has no fix	Tx/Rx wiring, GPS port; leave the drone outdoors under open sky.
Drone will not arm	The reason for blocking is shown in the Setup tab or in the OSD.

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@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.com

8.2 Product conformity



- 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@rotorاما.cz.
- **Product identification:** the type designation (ATOMRC Exceed F405) and the board version are printed on the circuit board and stated on the packaging; the firmware version is shown by the configurator after connecting 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.