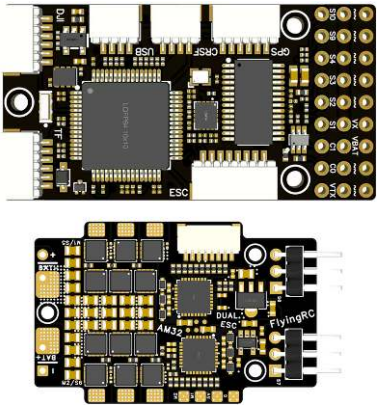
F4WSE Pro + Dual 40 A

User manual
FlyingRC F4WSE Pro flight controller and AM32 Dual 40 A two-channel ESC stack for model aircraft and flying wings



Read the whole manual before installation. A wrong wire sequence in the interconnecting cable will destroy both the flight controller and the ESC.

Version 1.0 · Rotorama, s.r.o.

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1. Safety instructions

1.1 Before you start

This product is a **set of electronic components for a model aircraft** – a flight controller with its base board and a two-channel ESC – not a finished product ready for use. The boards become usable only once they are installed in a model, connected to the other parts and configured.

- Read this whole manual before you start building and keep it for future reference.
- The stack works with battery voltage and with currents of tens of amperes. A wiring error may cause a **fire** or destroy the boards.
- Assembly requires experience with soldering and with model building. If you are unsure, ask an experienced modeller for help.
- The product is not a toy. It is not intended for children or for anyone not familiar with this manual.
- Do not use damaged boards – after a crash, after overheating, with a cracked board or with a burnt component.

1.2 Handling the boards

All three boards are sensitive to static electricity and to mechanical damage.

- Hold the boards by their edges; do not touch the solder pads, connectors or components.
- Discharge static electricity by touching an earthed metal object before handling them.
- Do not place the boards on metal or conductive surfaces, including the carbon fibre parts of the model.
- The SH1.0 connectors are small. When plugging or unplugging, support the socket with your fingers, otherwise it will be torn off the board.

1.3 Li-Po batteries

The flight controller is rated for **7–28 V** and the ESC for **6–26 V**. **The lower of the two values always applies** – the whole stack is therefore intended for **2–6S Li-Po** batteries. Connecting a battery with more cells destroys the boards immediately.

State	Li-Po	6S Li-Po	4S Li-Po
fully charged	4.20 V/cell	25.2 V	16.8 V
end the flight	3.50 V/cell	21.0 V	14.0 V
storage	3.80 V/cell	22.8 V	15.2 V

- Charge only with a charger intended for this cell type and never leave charging unattended.
- Do not use a battery with a swollen pouch, a damaged lead or after a heavy crash.
- Never connect the battery with reversed polarity – reverse polarity destroys both the ESC and the flight controller, and such damage is not a product defect.
- Charge and store batteries in a non-flammable container, away from flammable materials.
- Before connecting the battery, always check that the supplied filter capacitor is soldered to the ESC.

1.4 Rotating propellers and bench testing

Most of the setup can be done without propellers. Do not fit the propellers until the model is fully set up.

- **Always** remove the propellers before connecting the flight controller to a computer or before testing the motors.
- Secure the model mechanically during motor tests and never reach into the plane of the propellers.
- When adjusting ESC parameters or flashing firmware, power the ESC **from the battery**, not from USB – but always with the propellers removed.
- Watch out for the servos as well: the control surfaces may start moving on their own once the battery is connected.
- Never stand, and never let anyone else stand, in line with the propellers.

1.5 Temperature and cooling

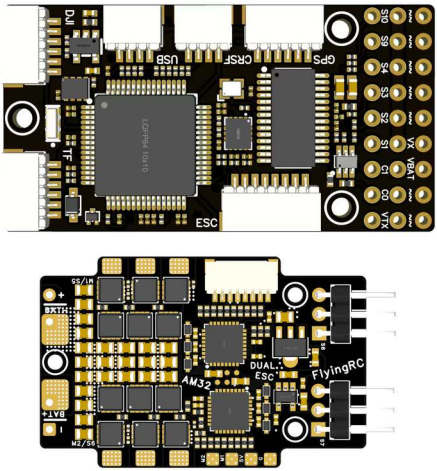
The ESC generates significant heat during operation. The MOSFETs and the copper areas around them get hottest.

- The ESC **must not** be covered with heat-shrink tubing, potted or given any waterproof treatment. Such measures impede heat exchange and damage caused by them is not covered under warranty.
- Stick the supplied aluminium heatsink onto the power section of the ESC and make sure air can flow around it.
- Route the motor wires so that they do not touch the components of the ESC.
- The boards must not touch carbon fibre parts of the model, battery plugs or other circuit boards – an external short circuit may cause damage.
- Let the boards cool down after a flight before you touch them.

When the ESC operates outside its rated conditions – higher ambient temperature, high humidity, low air pressure or no ventilation – the current-carrying capacity of its power devices is limited and the maximum continuous current falls below the nominal value.

2. Product description

The stack is intended for **fixed-wing models and flying wings** with two motors, or with one motor and a spare channel. It consists of the **FlyingRC F4WSE Pro** flight controller, a base board that distributes power and signals to it, and the two-channel **FlyingRC AM32 Dual 40 A** ESC. Both the flight controller and the ESC have mounting holes with a 17.8 × 31.8 mm pattern for M2 screws.



The F4WSE Pro flight controller and the AM32 Dual 40 A ESC

2.1 Package contents

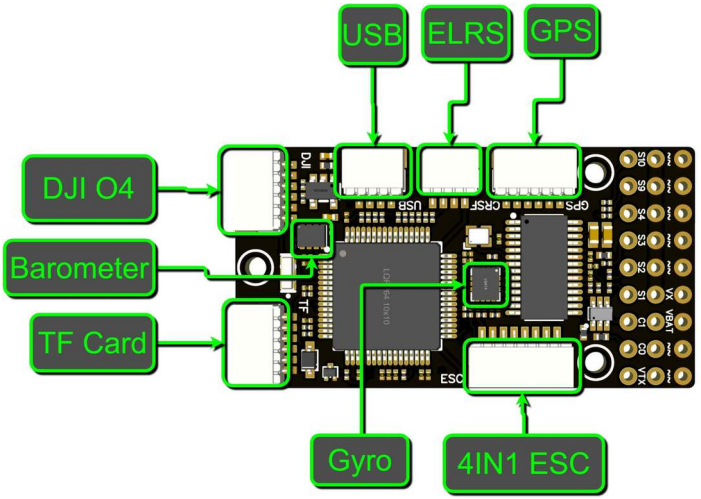
Qty	Item
1×	FlyingRC F4WSE Pro flight controller
1×	base board
1×	FlyingRC AM32 Dual 40 A ESC
1×	external USB-C module
1×	external TF card module
1×	20 × 20 × 4 mm aluminium heatsink
2×	220 µF / 35 V electrolytic capacitor
1×	SH1.0 8P cable, single-ended, 3.5 cm long
1×	SH1.0 8P connector with crimp terminals
1×	SH1.0 4P cable, double-ended, 10 cm long
1×	SH1.0 4P cable, double-ended, 15 cm long

Qty	Item
1×	SH1.0 6P cable, single-ended, 10 cm long
3×	9-pin header, 2.54 mm pitch
3×	3-pin right-angle header, 2.54 mm pitch
6×	M2 × 4 screw
3×	M2 × 5 standoff
3×	M2 × 7+7 standoff

The battery, motors, servos, receiver, GPS module, camera and video transmitter are not included.

2.2 Flight controller – connectors and pins

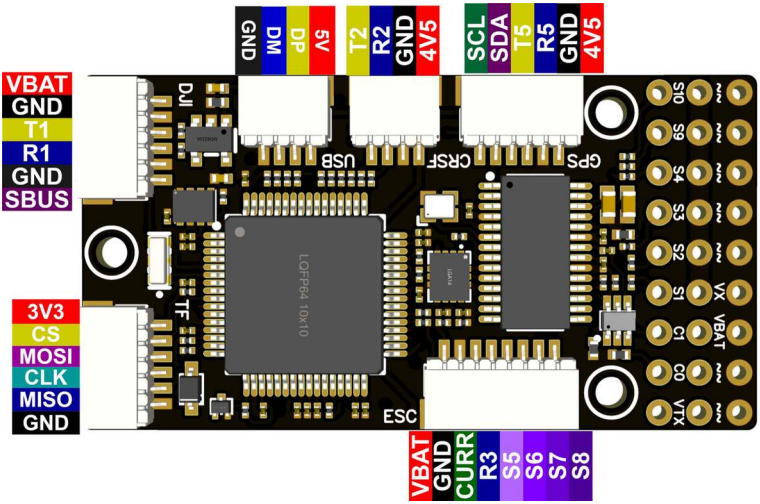
The receiver, GPS module, digital video transmitter, USB-C module, TF card module and the ESC all plug in through **SH1.0** connectors, with no soldering required. The remaining signals are available on the pin headers and solder pads of the base board.



Layout of the connectors and components of the flight controller

Connector	Pins
DJI	VBAT, GND, T1, R1, GND, SBUS
USB	GND, DM, DP, 5V
CRSF	T2, R2, GND, 4V5
GPS	SCL, SDA, T5, R5, GND, 4V5
TF	3V3, CS, MOSI, CLK, MISO, GND
ESC	VBAT, GND, CURR, R3, S5, S6, S7, S8

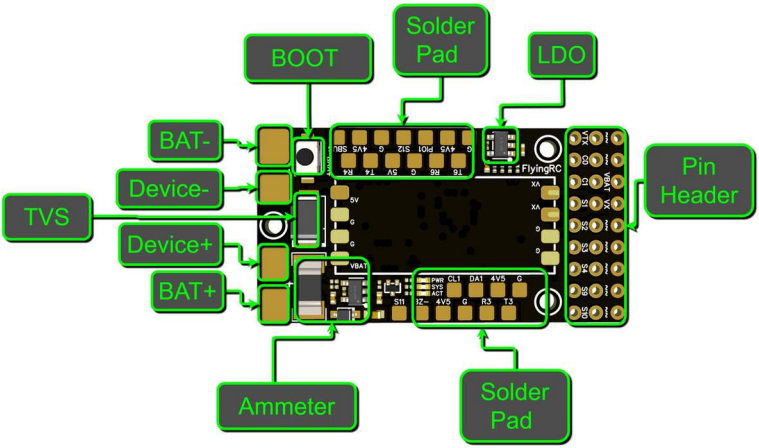
The ESC port is designed for signals and voltage detection only and cannot provide power to the flight controller.



Pin definitions of the flight controller's direct plug-in ports

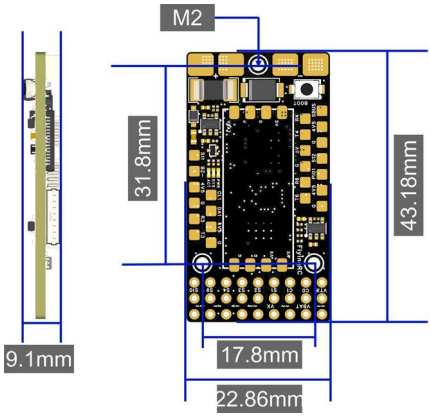
2.3 Base board

The base board carries the power input, the current sensor, both BEC rails, the BOOT button and all solder pads. It is joined to the flight controller by three 9-pin headers and M2 × 5 standoffs.



Base board – layout of the pins and components

Pin	Function
BAT+, BAT−	battery power input
ESC+, ESC−	power output to the ESC
S1–S4, S9, S10	PWM outputs on the pin header
S11, S12	PWM outputs on solder pads
VX, VBAT, 4V5, 5V, G	power pads for peripherals
C0, C1, VTX	inputs of the two analogue cameras and output to the video transmitter
SBUS	SBUS receiver input through the built-in inverter
R3, T3, R4, T4, R6, T6	serial ports on solder pads
CL1, DA1	I2C bus (SCL and SDA)
BZ−	passive buzzer output
PIO1	general-purpose input/output
PWR, SYS, ACT	power, system status and activity LEDs



Dimensions of the base board and the mounting hole pattern

2.4 Flight controller specifications

Model	FlyingRC F4WSE Pro
MCU	STM32F405RGT6, 168 MHz
Memory	1 MB Flash, 192 kB RAM
IMU (gyroscope and accelerometer)	ICM-42688-P; BMI270 on units placed on the market after 25 May 2026
Barometer	SPA06-001, I2C address 0x76
Magnetometer	no on-board magnetometer, an external module can be connected via I2C
Simulated OSD	AT7465E, analogue
Camera inputs	2× analogue, switchable in flight
Blackbox	external TF card module, 4 GB recommended, 32 GB maximum
Serial ports	6× UART
PWM outputs	12 channels – 6 via pin headers, 2 via solder pads, 4 via the ESC port
I2C bus	1×
SBUS	built-in inverter, internally connected to the RX pin of UART2
LED strip	WS2812; with INAV connect the signal to the S12 solder pad
Buzzer	passive buzzer supported
Power input	7–28 V, 2–6S Li-Po
BEC-Servo	5 V / 5 A
BEC-Device	5 V / 3 A
Current-ADC	80 A continuous, 120 A instantaneous
Dimensions	22.86 × 43.18 × 9 mm
Mounting holes	17.8 × 31.8 mm pattern, M2 screws
Weight	9.1 g
Working temperature	−10 °C to 100 °C
Storing temperature	0 °C to 40 °C

The flight controller is made in two hardware revisions that differ in the gyroscope fitted. The firmware is common to both and detects the chip type automatically. The revisions cannot be told apart visually – connect the board to a ground station to see which gyroscope is fitted.

2.5 Serial ports (UART)

In ArduPilot firmware the SERIAL numbers **do not** correspond one-to-one with the UART numbers printed on the board. Always follow the table below.

PCB silkscreen	UART	DMA	Recommended use	SERIAL
USB	USB	—	console	SERIAL0
TX1 RX1	USART1	yes	MSP DisplayPort	SERIAL1
TX3 RX3	USART3	no	user	SERIAL2
TX5 RX5	UART5	no	GPS	SERIAL3
TX4 RX4	UART4	no	user	SERIAL4
TX6 RX6	USART6	TX6 only	user	SERIAL5
TX2 RX2	USART2	yes	BRD_ALT_CONFIG = 1	SERIAL6
SBUS	SBUS pad	—	BRD_ALT_CONFIG = 0 (default)	SERIAL6

- Connect high-data-rate devices – CRSF receivers and high-definition air units – to DMA-enabled ports, that is to UART1 (SERIAL1) or UART2 (SERIAL6).
- The TX2 and RX2 pins and the SBUS pad share the same port. Use the *BRD_ALT_CONFIG* parameter to switch between them; the SBUS input is active by default.
- After connecting a device, set the protocol of the corresponding port – for a GPS module on R5 and T5 set *SERIAL3_PROTOCOL* to GPS and confirm that no other port is set to the same function.

2.6 PWM outputs

The flight controller has 12 PWM outputs for motors and servos. The outputs are divided into groups that share a common timer.

Group	Output	Timer	DShot
1	S1, S2 – pin header	TIM8	yes
2	S3, S4 – pin header	TIM1	yes
3	S5–S8 – ESC port	TIM2	yes
4	S9 – pin header	TIM12	no
5	S10 – pin header	TIM13	no
6	S11 – solder pad	TIM4	no
7	S12 – solder pad, LED strip	TIM3	yes

PWM channels in the same timer group cannot be used simultaneously for ESCs using DShot and servos using 50 Hz PWM. S9 to S11 have no DMA and therefore cannot be used for the DShot protocol.

2.7 I2C bus, voltage and current sensing

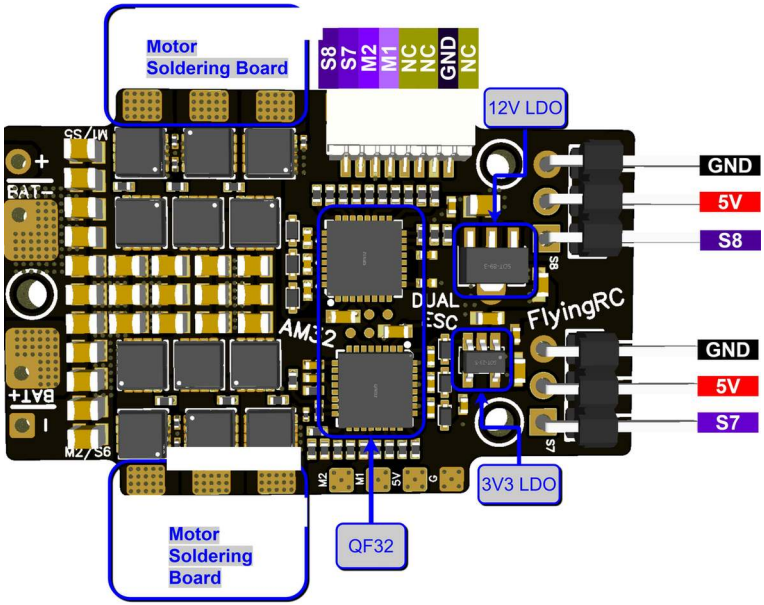
The I2C bus is brought out to the **CL1** (SCL) and **DA1** (SDA) pads of the base board and to the GPS port. An external compass or a digital airspeed sensor can be connected.

Device	Parameter	Value
onboard baro SPA06-001	Address	0x76
external compass	COMPASS_AUTODEC	1
digital airspeed I2C	ARSPD_BUS	1
MS4525 airspeed sensor	ARSPD_TYPE	1
DLVLR-L10D airspeed sensor	ARSPD_TYPE	9

The internal baro is at 0x76, so external devices that are also on 0x76 cannot be connected.

2.8 Electronic speed controller

The **AM32 Dual 40 A** ESC drives two motors. Each channel has its own MCU with an integrated gate driver. The power stage consists of twelve MOSFETs with an Rds(on) of 2.0 mΩ. The PCB has 6 layers with a total copper thickness of 12 oz.

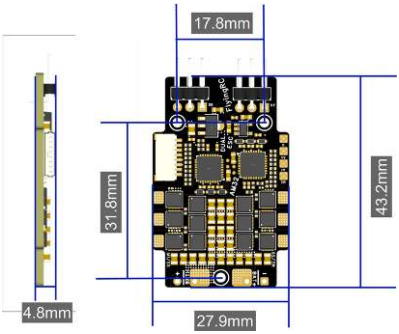


ESC – pad definitions and components

Pin	Function
BAT+, BAT−	connect to battery and capacitor positive and negative terminals
+, −	pads for the second capacitor
M1/S5, M2/S6	three-pad groups for the phases of the two motors
M1, M2	PWM/DShot signal input
G	GND (negative terminal)
S7, S8	pass-through channels routed to the servo headers

The ESC has no BEC of its own. The servos and the receiver are powered by the BEC of the flight controller.

2.9 ESC specifications



Dimensions of the ESC and the mounting hole pattern

Model	FlyingRC AM32 Dual 40 A
Channels	2
MCUs	2× QF32F4AK8U7, 32-bit, 120 MHz
Memory	64 kB Flash, 16 kB RAM
Integrated gate drivers	2× ID6288
MOSFETs	12× HYG022N04LS1C1, 40 V
Rds(on)	2.0 mΩ
Power input	6–26 V, 2–6S Li-Po
Continuous current per channel	40 A (test condition: 4S)
Burst current per channel	50 A for 5 seconds (test condition: 4S)
Firmware	AM32
Control signal input	DShot150/300/600, OneShot, PWM and other protocols
BEC	none
PCB	6 layers, 2 oz copper per layer, 12 oz in total, resin-filled vias, immersion gold plating
Dimensions	43.2 × 27.9 × 4.8 mm
Mounting holes	17.8 × 31.8 mm pattern, M2 screws
Weight	7.0 g
Working temperature	−10 °C to 100 °C
Storing temperature	0 °C to 40 °C

3. Legal conditions in the CR and the EU

3.1 The law of the country where you fly applies

Regulations (EU) 2019/947 and 2019/945 apply in all EU Member States, but national rules differ from country to country – registration portals, minimum pilot age, geographical zones, compulsory insurance, permitted frequency bands and transmit power. This chapter describes the situation in the Czech Republic. If you fly the model elsewhere, follow the rules of that state.

3.2 The stack is a component, not a complete model

Neither the flight controller nor the ESC is an unmanned aircraft. Regulation (EU) 2019/945, which defines classes C0 to C6, applies to complete unmanned aircraft systems bearing a class identification label, not to individual parts. The boards therefore cannot bear a class marking. They contain no radio equipment either – the receiver and the video transmitter are bought separately and have their own documentation.

Once the boards are installed in a model, Regulation (EU) 2019/947 and the related Czech rules apply to the **operation** of that model. The operator is responsible for complying with them.

3.3 Operator registration and operational category

These obligations concern the model you build the boards into.

- The operator must **register** if the model has a take-off mass of 250 g or more, or if it carries a sensor able to capture personal data, in particular a camera – then regardless of mass. Registration is run by the Civil Aviation Authority at dron.caa.gov.cz; the assigned number must be marked on the model.
- A model without a class marking may be operated as a **privately built unmanned aircraft system** – in subcategory A1 with a take-off mass below 250 g and a speed below 19 m/s, otherwise in subcategory A3. Subcategory A2 is not available, so expect **subcategory A3**.
- The usual limits of the open category apply: a height of **up to 120 m** above ground, continuous visual line of sight and no flying over assemblies of people. Subcategory A3 also requires 150 m separation from residential, commercial, industrial and recreational areas.
- If you fly with FPV goggles, a **UA observer** must stand next to you and keep the model in sight without visual aids.
- Check the geographical zones on the dronemap.rlp.cz map before flying.
- **Liability insurance** is mandatory in subcategory A3 above a take-off mass of 4 kg. For lighter models we still recommend it.
- An alternative is membership of a model flying association authorised under Article 16 of Regulation (EU) 2019/947.

4. Installation and wiring

4.1 What else you need

- a temperature-controlled soldering iron, solder and thin silicone wire for the signals; for the power leads, wire with a cross-section matching the current drawn
- a 2–6S Li-Po battery with sufficient current capability
- two motors and propellers suited to the model
- servos for the control surfaces
- a receiver and, optionally, a GPS module, a camera and a video transmitter
- a computer with a ground station or configurator and a USB-C cable with data wires

4.2 Installation in the model

- Mount the flight controller and the ESC so that they do not touch any conductive parts of the model.
- Place the flight controller as close to the centre of gravity as possible and orient it according to the arrow on the board; a different orientation can be compensated for by parameters in the ground station.
- Mount the flight controller on soft tape or vibration dampers so that motor vibrations are not transmitted to it.
- Place the ESC in the airflow and stick the supplied heatsink onto it.
- Join the flight controller and the base board with the supplied M2 × 5 standoffs and M2 × 4 screws; mount the ESC with the M2 × 7+7 standoffs.

4.3 Power supply and capacitors

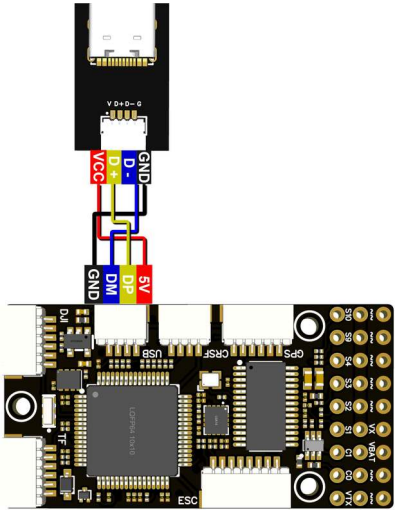
Battery power is fed to the **BAT+** and **BAT−** pads of the ESC and from there to the **BAT+** and **BAT−** pads of the base board.

- **Always** solder the supplied 220 µF / 35 V electrolytic capacitor to the power pads of the ESC. Without it there is a risk of voltage spikes, gyroscope noise and destruction of the ESC.
- Solder the capacitor as close to the boards as possible and with the correct polarity – the stripe on the can marks the negative terminal.
- Keep the power wires as short as possible, twist them and route them away from signal wires and the receiver antenna.
- Check the polarity and look for short circuits before connecting the battery for the first time.

The ESC port of the flight controller cannot supply power. Power must be fed to the base board through separate wires.

4.4 USB-C module

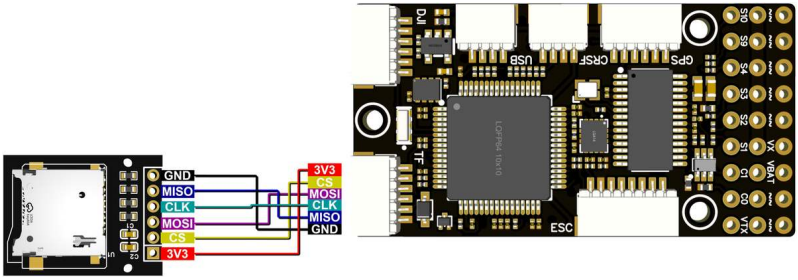
The flight controller has no USB connector of its own. The external USB-C module plugs into it with the supplied SH1.0 4P cable, without soldering. Place the module so that it stays accessible once the stack is in the model.



Connecting the USB-C sub-board

4.5 TF card module

Flight logs are stored on the external TF card module. The module plugs into the **TF** port and can be mounted away from the flight controller.



Wiring diagram for connection to the TF sub-board

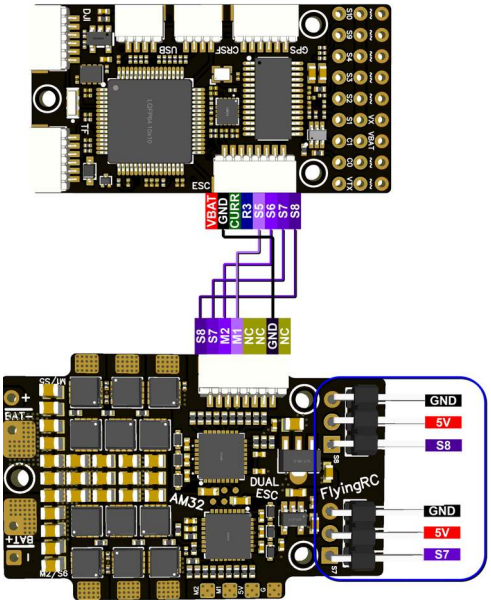
- Recommended card capacity is 4 GB, maximum supported capacity 32 GB.
- Format the card to the FAT32 file system before first use.
- If you solder the module instead, observe the wire order – the signals cross between the board and the module.

4.6 Connecting the flight controller and the ESC

A single **SH1.0 8P** cable connects the flight controller and the ESC. The cable comes crimped on the ESC side; the other end is either soldered to the pads or fitted with the supplied connector.

Flight controller	ESC	Function
GND	GND	common ground
S5	M1	motor 1 signal
S6	M2	motor 2 signal
S7	S7	pass-through channel to the ESC servo header
S8	S8	pass-through channel to the ESC servo header
VBAT	—	not connected
CURR	—	not connected
R3	—	not connected

Before connecting the battery for the first time, always compare the wire sequence with both connectors as shown in the figure. A wrong sequence destroys both the flight controller and the ESC.

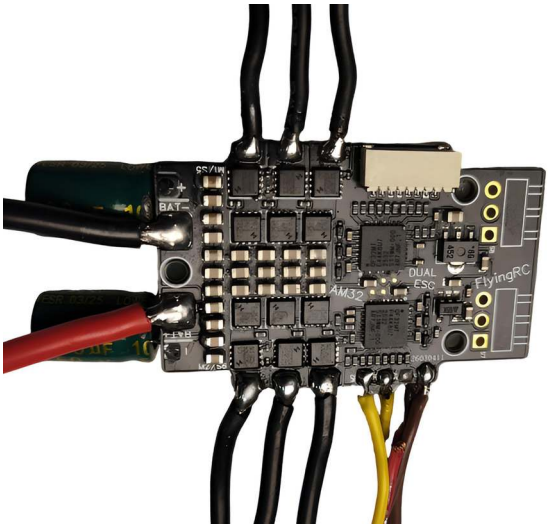


Wiring diagram between the flight controller and the ESC

4.7 Motors

The phases of the two motors are soldered to the pad groups marked **M1/S5** and **M2/S6**. The phase order is not fixed – the direction of rotation is set in the ESC firmware or by swapping any two wires.

- Shorten the motor wires to the minimum length needed and route them away from the components of the ESC.
- Do not overheat the pads or the wires; use a soldering iron with enough power and keep the contact short.
- After soldering, check that no solder bridge is left between the phases.



The soldered ESC with the capacitor and the motor wires

4.8 Servos

The servos are connected to the PWM outputs. They are powered by the BEC-Servo rail of the flight controller, rated **5 V / 5 A**.

- Outputs S1 to S4, S9 and S10 are on the pin header of the base board, outputs S11 and S12 on solder pads.
- Channels S7 and S8 pass through the ESC and end in right-angle 3-pin headers with GND, 5 V and signal pins.
- Servos in the same timer group as the motors cannot run on PWM if DShot is used for the motors – see Chapter 2.6.
- The total servo current must not exceed the BEC rating; use a separate power supply for high-power servos.

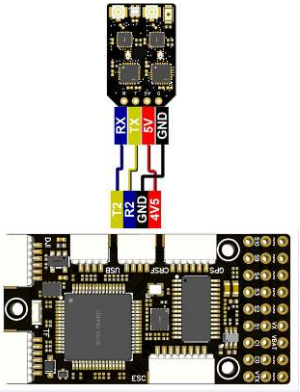
The servo headers on the ESC supply 5 V only when BEC power is fed to the ESC. Measure the voltage before connecting the servos.

4.9 Receiver

The receiver is connected according to the protocol it uses. The 4V5 supply comes from the BEC of the flight controller.

▶ CRSF or ExpressLRS receiver

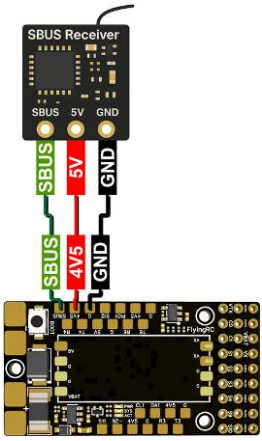
Connect the receiver to the **CRSF** port. The TX and RX pins cross between the receiver and the flight controller.



The wiring diagram for connecting an ExpressLRS receiver to the CRSF port

▶ SBUS receiver

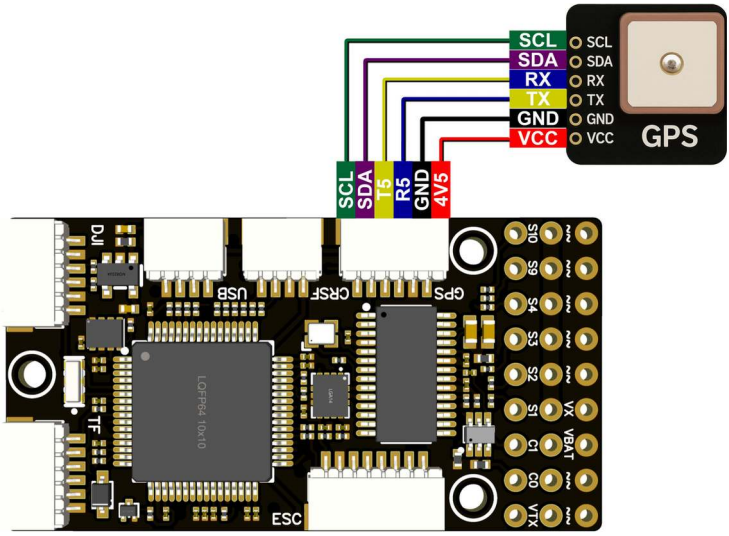
Connect the SBUS signal to the **SBUS** pad. The inverter is built in, so no external inverter is needed. In ArduPilot leave *BRD_ALT_CONFIG* at 0.



The wiring diagram for connecting an SBUS receiver

4.10 GPS module and magnetometer

The GPS module plugs into the **GPS** port, which carries the I2C bus for a magnetometer in addition to the serial port.

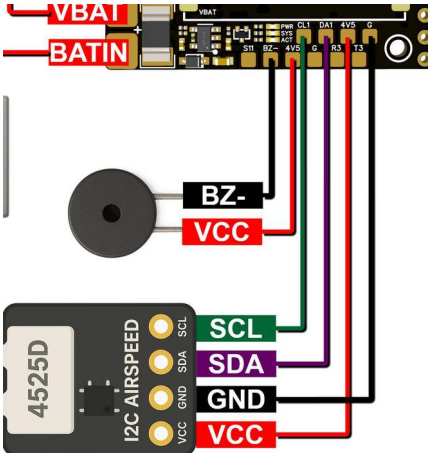


The wiring diagram for connecting a GPS module

- Mount the module as far as possible from the power wires, the ESC and the video transmitter.
- The flight controller has no on-board magnetometer. For navigation modes that need heading information, use a GPS module with a magnetometer or a separate magnetometer on I2C.
- In ArduPilot set *SERIAL3_PROTOCOL* to GPS.
- Always check the pinout against the silk-screen markings on your particular GPS unit – it differs between manufacturers.

4.11 Airspeed sensor and buzzer

A digital airspeed sensor is connected to the I2C bus, that is to the **CL1** and **DA1** pads. A passive buzzer is connected to the **BZ−** pad and to a power pad.

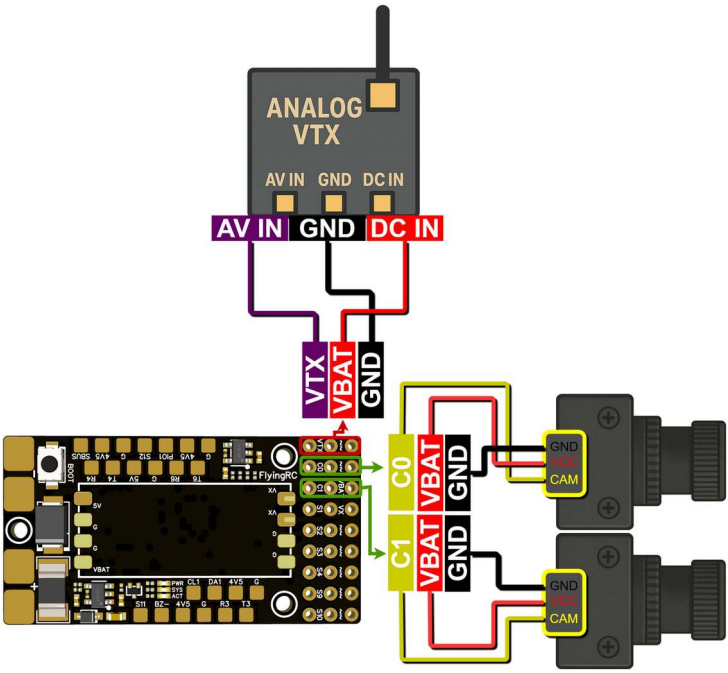


Buzzer and I2C airspeed sensor wiring

The supported airspeed sensor types are MS4525 and DLVLR-L10D. The airspeed sensor is not included.

4.12 Cameras and analogue video transmitter

The flight controller has an OSD for analogue video transmission and **two camera inputs** that can be switched in flight.

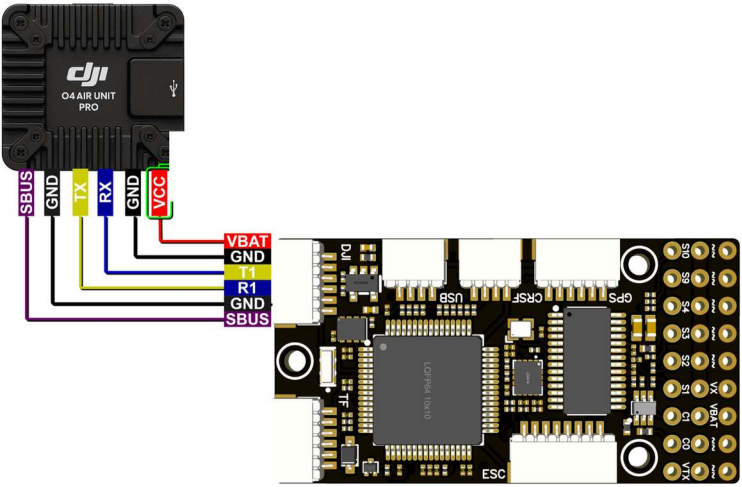


The wiring diagram for connecting two analogue cameras and the video transmission unit

- Connect the camera video signals to the **C0** and **C1** pads and the video transmitter input to the **VTX** pad.
- The cameras and the video transmitter must share a common ground with the flight controller.
- Power the camera and the video transmitter only from a voltage they are rated for. The VBAT pad carries the battery voltage.
- In ArduPilot, camera switching is configured as a relay: *RELAY2_PIN* = 82, *RELAY2_FUNCTION* = 1, plus a transmitter channel assignment, for example *RC8_OPTION* = 34.

4.13 Digital video transmitter

A digital video transmission unit plugs into the **DJI** port, which carries VBAT power and the SBUS signal in addition to the serial port.



The wiring diagram for connecting a digital video transmission unit

Check what supply voltage your video transmitter can withstand. The VBAT pin carries the battery voltage, which reaches 25.2 V with a 6S pack.

4.14 LED strip

An addressable WS2812 LED strip is connected to the **S12** solder pad. In ArduPilot set *SERVO12_FUNCTION* = 120 and *NTF_LED_TYPES* to neopixel; with INAV firmware the LED strip signal also goes to the S12 pad.

5. Commissioning

5.1 Connecting to a computer

- Remove the propellers.
- Connect the flight controller to the computer through the supplied USB-C module, using a cable with data wires.
- When flashing ESC firmware or adjusting ESC parameters, a battery must be connected – the ESC is not powered from USB.
- If the board does not respond, try another cable first and only then the DFU mode with the BOOT button.

5.2 Flight controller firmware

ArduPlane firmware is pre-installed by default. The board is also supported by INAV and Betaflight; PX4 is not supported.

Firmware	Board target
ArduPilot	FlyingRC_F4WSE_Pro
INAV	FLYINGRCF4WSEPRO
Betaflight	FLYINGRCF4WSEPRO

- For fixed-wing aircraft and flying wings, **ArduPlane** or INAV firmware is recommended.
- The board is also directly compatible with **MatekF405-TE** firmware, so established procedures and configuration files can be reused.
- Flash the firmware from a ground station such as Mission Planner, or from the configurator of the firmware concerned.
- The latest firmware and configuration files are on the manufacturer's website.

5.3 Basic flight controller settings

After flashing the firmware, set at least the following parameters.

Function	Parameter	Value
blackbox logging to the TF card	LOG_BACKEND_TYPE	1
voltage sensing pin	BATT_VOLT_PIN	14
voltage divider ratio	BATT_VOLT_MULT	21.0
current sensing pin	BATT_CURR_PIN	15
current meter ratio	BATT_AMP_PERVLT	100

In INAV the default voltage ratio is 2100 and the current ratio 100.

Always compare the readings with reality and adjust the ratios.

5.4 ESC firmware

The ESC is pre-flashed with **AM32** firmware and tested before shipment. It can only be updated with the **offline AM32 parameter tuning software**, which connects to the ESC through the flight controller.

Do not use the web-based parameter adjustment software. According to the manufacturer it has already damaged the ESC MCU in several reported cases. Such a fault requires a factory return and incurs a service fee.

① Remove the propellers and connect the battery.

② Close the flight controller configurator so that it releases the serial port.

③ Start the offline AM32 software, select the COM port of the flight controller and click Connect.

④ On the *Flash* page select channel M1, load the firmware file and start flashing.

⑤ When flashing is finished, use Send Default Settings to restore the default parameters.

⑥ Repeat the whole procedure for channel M2.

The firmware for this ESC is named **AM32_F4A_4IN1_F421**. The name contains “4IN1” even though this is a two-channel ESC – that is how the manufacturer lists it.

5.5 ESC parameters

Parameter	Setting
Motor KV	must be set close to the motor's rated KV; the deviation must not exceed 30 %
Timing Advance	**forbidden to adjust** – incorrect adjustment will damage the ESC, usually irreparably
Stall Protection	enable it for low-KV motors (KV below 500); it must be enabled with sine-wave startup
Sinusoidal Startup	gives high torque at low speed; not required for general models
Reverse Rotation	reverses the direction of motor rotation

If the KV value setting deviates from the actual KV by more than 100 %, the motor may fail to operate normally and the ESC hardware may even be damaged.

5.6 Accelerometer calibration

- Place the model on a level surface in its flight attitude and start the accelerometer calibration in the ground station.
- Follow the on-screen instructions and hold the model still in each position.
- Repeat the calibration whenever the mounting of the flight controller changes.
- If a magnetometer is connected, calibrate it as well – outdoors and away from metal structures.

5.7 Checking the motors and servos

Always carry out the following checks **with the propellers removed**.

- In the ground station check that the motors run in the right order and direction; change the direction with the *Reverse Rotation* option in the ESC firmware or by swapping two phases.
- Check the travel and the sense of every control surface; correct a reversed sense in the settings, not by swapping the servo wires.
- Make sure the servos do not bind or stall at the ends of their travel.
- On a flying wing, check that the elevons respond correctly to both axes.

5.8 Arm, Disarm and failsafe

- Assign **Arm** and **Disarm** to a switch on the transmitter, not to a throttle stick movement.
- Before every flight, check that the model does not spin up on its own after arming.
- Set up and test the **failsafe** – the behaviour on signal loss. Return to the launch point is usual for fixed-wing models, immediate motor shutdown for small models.
- Test the failsafe on the ground by switching off the transmitter, with the model secured and the propellers removed.

5.9 Flight data logging

- The logs are stored on the TF card in the module connected to the TF port.
- Always insert and remove the card with the battery disconnected.
- Delete the logs regularly; a full card stops the logging.
- Without the TF card module or the card the blackbox is unavailable; the other functions are not affected.

6. Operation

6.1 Pre-flight check

Go through this list before every flight:

- The propellers are undamaged, correctly oriented and tight.
- All boards are firmly mounted and no wire is loose or chafed.
- The motor wires do not touch the components of the ESC.
- The control surfaces move freely, the pushrods are secured and the servos do not bind.
- The receiver antenna is connected and not kinked.
- The transmitter is on, its battery is charged and the Arm switch is off.
- A **fully charged** battery is fitted – 4.20 V per cell.
- The battery plug is secured and the battery is strapped down.
- You have checked the radio range and the failsafe function.

6.2 Monitoring the battery voltage

The stack measures both voltage and current and passes the values to the OSD and to telemetry.

- End the flight at **3.50 V per cell** at the latest – that is 21.0 V with a 6S pack and 14.0 V with a 4S pack.
- Deep discharge permanently damages the battery and reduces its capacity.
- The voltage reading fluctuates under load; what counts is the resting voltage after landing.
- Let the battery cool down after a flight before charging it.

6.3 Temperature

Under high load the ESC becomes the hottest part of the whole model.

- Disconnect the battery between flights.
- Do not leave the model standing in the sun with the battery connected.
- If the ESC temperature rises excessively, check for seized motors and damaged propellers and verify the KV setting.

7. Maintenance and troubleshooting

7.1 After every flight

- Disconnect the battery and let the boards cool down.
- Check the solder joints, the motor wires, the control surface pushrods and the antenna mounting.
- Remove dirt with a soft brush; do not use solvents.
- After a crash, always inspect the boards against the light – look for cracked joints and loose components.

7.2 Soldering and repairs

- Use a temperature-controlled soldering iron; the ESC pads need enough power, the flight controller pads a fine tip.
- Do not overheat the pads – a lifted pad cannot be repaired.
- Always disconnect both the battery and USB before soldering.
- Desoldering a component or modifying a board is not a product defect and cannot be claimed under warranty.

7.3 Storage

- Store the boards in an antistatic bag, in a dry place and out of the reach of children.
- Store batteries charged to **3.80 V per cell**, that is 22.8 V for a 6S pack.
- Check the batteries regularly during longer storage.

7.4 Troubleshooting

Problem	Possible cause	Solution
The board does not appear in the configurator	USB cable without data wires, USB-C module not connected	try another cable and check the module connector; if problems persist, flash the firmware in DFU mode
Nothing lights up after connecting the battery	wrong wire sequence, reversed polarity	disconnect the battery immediately and check the wiring against Chapter 4.6
A motor does not run or runs the wrong way	swapped wires, reversed direction in the ESC firmware	check the channel assignment and change the direction with *Reverse Rotation*
The motor starts jerkily or beeps and stops	incorrect motor KV setting	set *Motor KV* to the actual KV of the motor
A servo does not move or jitters	output in the same group as DShot motors, overloaded BEC	move the servo to an output in another group as described in Chapter 2.6

Problem	Possible cause	Solution
The ESC overheats	no airflow, overload, seized motor	check the motors and propellers, fit the heatsink, never use heat-shrink tubing
The receiver does not communicate	TX and RX swapped, wrong port assignment	cross the TX and RX wires; for SBUS leave BRD_ALT_CONFIG = 0
The GPS gets no fix	wrong port assignment, interference from the power wiring	set SERIAL3_PROTOCOL to GPS and move the module further from the wires
The video is noisy or missing	poor camera power supply, missing common ground	check the camera and video transmitter voltages and the common ground
The voltage fluctuates, the gyroscope is disturbed	missing or badly soldered capacitor	solder the supplied capacitor to the power pads of the ESC
The displayed voltage does not match reality	uncalibrated voltage divider	compare it with the battery voltage and adjust BATT_VOLT_MULT

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.cz

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 is printed on the circuit boards – *FlyingRC F4WSE Pro* on the flight controller and the base board and *AM32 DUAL ESC* on the ESC.

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 manufacturer does not issue separate warranty terms for this product.

- 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.