EL24P TCXO

Flywoo – ExpressLRS 2.4 GHz receiver
User manual



Read the safety instructions in Chapter 1 before installation. Operate the receiver only with the antenna connected.

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1. Safety instructions

1.1 Before you start

The receiver is an electronic component designed to be installed in a radio-controlled model, typically an FPV drone. Installation requires soldering and configuration of the flight controller (FC). Before installation, read this entire manual as well as the manuals of the drone, flight controller and radio you will use the receiver with.

- This product is not a toy. It contains small parts that a child could swallow – keep it out of the reach of children.
- The receiver is part of the model's control link. Incorrect installation or configuration may lead to loss of control over the model and thus to property damage or personal injury.
- Carry out all wiring and configuration work **with the propellers removed**.

1.2 Electrical safety

- Power the receiver only with **5 V** from the 5 V output of the flight controller. Never connect it directly to the flight battery.
- Observe the supply polarity (+ and −). Reverse polarity or a short circuit will destroy the receiver.
- Solder only with the battery and the USB cable disconnected. Solder quickly and with a moderate tip temperature so that the solder pad does not lift off.
- The board is sensitive to static electricity. Touch a grounded object before handling it and do not touch the components with your fingers.
- After wiring, insulate the receiver with the supplied heat shrink tubing so that its contacts cannot touch the carbon frame or other electronics.

1.3 Antenna and radio operation

- Operate the receiver **only with the antenna connected** as supplied by the manufacturer. A different antenna may change the transmitted power and violate the conditions for operating radio equipment.
- The IPEX connector is fragile. Press it on perpendicular to the board, do not pull on the antenna cable and do not bend the cable sharply at the connector.
- The Wi-Fi mode of the receiver is intended only for configuration and firmware updates on the ground. Never take off in this mode.
- Before every flight, check the link with the radio and the failsafe function (Chapter 6).

2. Product description

2.1 Intended use

The Flywoo ELRS 2.4G EL24P TCXO is a miniature **ExpressLRS** receiver for the 2.4 GHz band. It receives control commands from the radio and passes them to the flight controller (FC) using the CRSF protocol; it sends telemetry back to the radio.

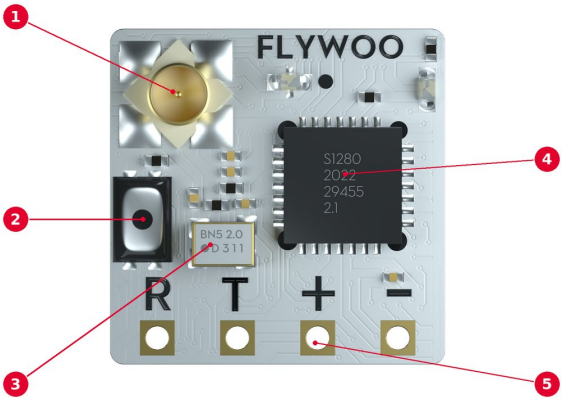
According to the manufacturer, the receiver uses a temperature-compensated crystal oscillator (TCXO), which improves the accuracy of the clock frequency and thus the performance and reliability of the RC link. The EL24P variant has an IPEX connector for an external dipole antenna (T antenna). The firmware can be updated via Wi-Fi.

2.2 Package contents

- 1× Flywoo TCXO 2.4G ELRS EL24P receiver
- 1× T antenna with IPEX connector
- 1× silicone cable
- 1× heat shrink tubing

Not included: a radio or ExpressLRS transmitter module, a flight controller (FC) and installation tools.

2.3 Parts overview



Receiver, component side (without antenna)

① IPEX connector for the antenna

② Button – binding, Wi-Fi activation, bootloader mode (boot)

③ Temperature-compensated crystal oscillator (TCXO)

④ SX1280 radio chip

⑤ Solder pads **R** (data input), **T** (data output), **+** (5 V), **−** (GND)

2.4 Specifications

Parameter	Value
Designation	Flywoo ELRS 2.4G EL24P TCXO
System	ExpressLRS, 2.4 GHz ISM band
Microcontroller	ESP8285
Radio chip	SX1280 (or SX1281) IMLTRT
Oscillator	TCXO
Frequency range (manufacturer's data)	2400–2500 MHz
Refresh rate	25–500 Hz
Supply voltage	5 V
Protocol to the flight controller	CRSF
Antenna	external dipole (T antenna), IPEX connector
Weight	0.44 g (without antenna)
Dimensions	10 × 10 × 6 mm
Firmware target	Flywoo EL24P TCXO 2.4GHz RX
Firmware update	Wi-Fi, UART, Betaflight passthrough

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

3.1 The law of the country of operation applies

Radio equipment and unmanned aircraft are governed by European Union legislation that applies in all member states. However, national implementing regulations differ from country to country – permitted frequency bands, maximum transmit power, operator registration and flight rules. The information in this chapter describes the situation in the Czech Republic. If you operate the product in another country, you must comply with the regulations of the country in which you operate it.

3.2 Radio frequencies and transmit power

The receiver does not only receive but also transmits: in the 2.4 GHz band it sends telemetry to the radio, and in Wi-Fi mode it transmits a Wi-Fi network in the 2.4 GHz band. In the Czech Republic, operation is governed by the general authorisations of the Czech Telecommunication Office (ČTÚ):

Band	Limit	ČTÚ general authorisation
2400–2483.5 MHz	25 mW e.i.r.p.	VO-R/10 – short range devices
2400–2483.5 MHz	100 mW e.i.r.p.	VO-R/12 – wideband data transmission

- Operate the product only in the 2400–2483.5 MHz band and only with the antenna supplied by the manufacturer.
- The manufacturer does not state the maximum transmitted power in its publicly available documentation. You can request this information from the importer together with the EU Declaration of Conformity (Chapter 8).
- When building the firmware, select the regulatory domain corresponding to the country of operation. The user is responsible for the settings and for compliance with the limits; outside the Czech Republic, the limits of the respective country apply.

3.3 Drone operation

The receiver itself is not an unmanned aircraft. Operation of the drone in which you install it is governed by Regulation (EU) 2019/947 and, in the Czech Republic, by the rules of the Civil Aviation Authority (operator registration, pilot competence, operational limits). Details can be found in the drone manual and at www.caa.cz.

4. Installation and wiring

4.1 What else you need

- a radio with a built-in or external **ExpressLRS 2.4 GHz** module; the first number of the firmware version of the transmitter and the receiver must match,
- a flight controller (FC) with a free serial port (UART) and a 5 V output,
- a soldering iron, solder and a computer with Betaflight Configurator and ExpressLRS Configurator.

4.2 Connecting to the flight controller

Connect the receiver with the supplied silicone cable to any free full UART of the flight controller. The data wires are connected **crosswise**:

Pad	Function	Connect to the flight controller
R	receiver data input	TX of the selected UART
T	receiver data output	RX of the same UART
+	5 V supply	5 V output
–	ground (GND)	GND

① Disconnect the battery and the USB cable from the flight controller.

② Solder the wires to the receiver pads and to the corresponding flight controller pads according to the table.

③ Check that there is no short circuit between adjacent pads and that the supply polarity is correct.

④ Connect the antenna (Chapter 4.3) and insulate the receiver with the supplied heat shrink tubing.

⑤ Mount the receiver in the frame so that it is not exposed to vibration and does not touch carbon parts.

4.3 Antenna installation

- Place the antenna connector onto the IPEX connector ① vertically from above and press until it clicks.
- Route the antenna cable without sharp bends and secure it (e.g. with a cable tie) so that vibration cannot loosen the connector.
- Place the active part of the antenna as far as possible from the carbon frame, motors, electronic speed controllers (ESC) and the video transmitter (VTX), ideally outside the frame outline where the propellers cannot hit it.
- Replace a damaged antenna or cable – do not shorten or repair it.

4.4 Flight controller setup (Betaflight)

① On the *Ports* tab, enable *Serial RX* on the UART to which the receiver is connected.

② On the *Receiver* tab, set *Receiver Mode* to *Serial (via UART)* and *Serial Receiver Provider* to **CRSF**.

③ Enable *Telemetry*. Leave *RSSI Channel* and *RSSI ADC* disabled.

④ The CRSF protocol requires a non-inverted full-duplex UART. In the CLI, check *set serialrx_inverted = off* and *set serialrx_halfduplex = off* and store with the *save* command.

⑤ Close Betaflight Configurator and disconnect USB so that the connection to the receiver is refreshed.

※ Leave the serial baud rate of the receiver at the default value of 420000 Bd.

5. Binding and configuration

5.1 Binding with a binding phrase

The recommended binding method is a shared **binding phrase** – a password set identically in the transmitter module and in the receiver. Choose a unique phrase of at least 8 alphanumeric characters. In the receiver, you set it in ExpressLRS Configurator when building the firmware or in the receiver's web interface (Chapter 5.4). A receiver with the same phrase connects to the transmitter automatically after power-up.

A receiver with a binding phrase set will not enter manual binding mode.

5.2 Manual binding (bind)

① Switch off the radio.

② Put the receiver into binding mode in one of these ways: power it up three times in a row, each time disconnecting the power within 2 seconds after the LED lights up; or hold button ② on the receiver for about 1.5 s; or use the *Bind Receiver* button in Betaflight Configurator (if supported by your Betaflight and firmware versions).

③ The receiver LED double-blinks quickly – the receiver is in binding mode.

④ Switch on the radio and select *[Bind]* in the ExpressLRS Lua script.

⑤ The receiver LED lights up solid – binding is complete.

To cancel binding mode, restart the receiver (disconnect and reconnect power) or complete a successful binding.

5.3 LED indication

LED	Meaning
solid on	connected to the transmitter (or bootloader mode active)
slow blinking (500 ms)	waiting for connection from the transmitter
double blink, then pause	binding mode
triple blink, then pause	connected, but Model Match configuration mismatched
medium blinking (100 ms)	radio chip not detected
fast blinking (25 ms)	Wi-Fi mode enabled

5.4 Wi-Fi mode and web interface

The web interface is used to configure the receiver (binding phrase, serial link parameters, etc.) and to update the firmware. Wi-Fi mode is enabled:

- automatically about 60 s after power-up if the receiver does not establish a link with the transmitter (the interval can be changed),
- via the *Enable RX WiFi* option in the ExpressLRS Lua script,
- by holding button ② on the receiver for about 5 s.

Then connect your phone or computer to the **ExpressLRS RX** network with the password **expresslrs** and open **http://10.0.0.1/** in your browser. The small antenna of the receiver has a limited Wi-Fi range – keep your device close to it.

5.5 Firmware update

- Build the firmware in **ExpressLRS Configurator**; select **Flywoo EL24P TCXO 2.4GHz RX** as the target.
- Updating is possible via Wi-Fi (upload the file in the web interface with the *Update* button), via UART or via the flight controller (Betaflight passthrough).
- The first number of the firmware version of the receiver and the transmitter module must match, otherwise no link will be established.
- Do not disconnect the receiver from power during the update.

※ The manufacturer states that the factory firmware is labelled “Flywoo EL24E 2.4GHz RX”. When updating, always select the target given above.

5.6 Further documentation

Official ExpressLRS documentation – up-to-date procedures for binding, configuration and firmware updates for all firmware versions.

www.expresslrs.org

ExpressLRS Configurator – download page of the official program for building and flashing the firmware.

github.com/ExpressLRS/ExpressLRS-Configurator

6. Operation

6.1 Pre-flight check

- The antenna is connected, undamaged and secured; the IPEX connector is firmly seated.
- After switching on the radio and the drone, the receiver LED is solid on (connected).
- On the *Receiver* tab in Betaflight, all channels respond correctly to stick and switch movements.
- The radio displays telemetry (e.g. link quality) from the receiver.

6.2 Failsafe

Configure the failsafe (reaction to signal loss) in the flight controller on the *Failsafe* tab in Betaflight. Test the function **with the propellers removed**: Arm (start the motors), switch off the radio and check that the motors stop and the flight controller reports failsafe. Repeat the test after every configuration change.

7. Maintenance and troubleshooting

7.1 Maintenance

- After every crash, check the antenna, its cable, the IPEX connector and the solder joints.
- Protect the receiver from moisture, dust and dirt. Let a wet receiver dry thoroughly before switching it on again.
- Store it in a dry place at room temperature in an antistatic bag.

7.2 Troubleshooting

Problem	Cause and solution
LED off	No power. Check pads + and − and the 5 V output.
LED blinks slowly, no link	Binding phrase or first number of the firmware version of transmitter and receiver do not match. Align them or bind the receiver manually (Chapter 5.2).
LED triple-blinks	Model Match settings do not match. Adjust them or disable the function.
LED solid, but Betaflight shows no channels	R and T wires swapped, Serial RX enabled on another UART or wrong protocol. Check Chapters 4.2 and 4.4.
Manual binding does not work	A binding phrase is set in the receiver. Bind using the phrase or remove it in the web interface.
Short range, dropouts	Damaged or poorly placed antenna, loose IPEX connector. Replace or relocate the antenna.
Cannot connect to Wi-Fi	The receiver is not in Wi-Fi mode (LED blinks very fast) or the device is too far away.

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 is **EL24P TCXO** (Flywoo ELRS 2.4G EL24P TCXO); due to its size, the board itself bears only the FLYWOO marking. The firmware version can be found in the receiver's web interface or in the ExpressLRS Lua script.

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.