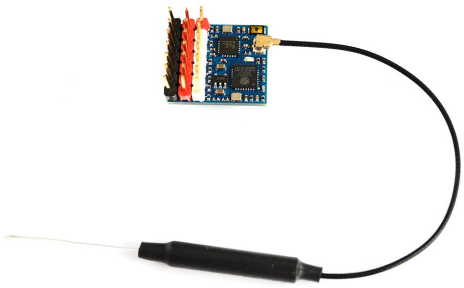
ELRS-R24-P6

Matek ELRS 2.4G PWM RX
ExpressLRS 2.4 GHz receiver · User manual



Read this manual carefully before installation and first use, especially the safety instructions and the failsafe setup. Keep this manual.

Rotorama, s.r.o. · www.rotorama.com · info@rotorama.cz

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1. Safety instructions

1.1 Before you start

The Matek ELRS-R24-P6 receiver is intended for controlling radio-controlled models. Read the entire manual before installation and first use and keep it for future reference. If you pass the product on to another person, include this manual.

- This product is not a toy. It is not intended for children without adult supervision.
- The receiver is supplied as a bare board without a case and without a soldered pin header. Installation requires basic electronics soldering skills.
- Protect the board from moisture, dust, metal chips and conductive objects – risk of short circuit.
- Do not modify the product other than as described in this manual.

1.2 Power supply and wiring

- Power the receiver only with a DC voltage of **4–9 V** applied to the **+** and **G** pads. A higher voltage will permanently damage the receiver.
- Connect only the measured battery voltage to the **VBat** pad, max. **34 V** (2S–8S). Never confuse the VBat pad with the **+** power row.
- Check the polarity before every connection. Reverse polarity can destroy the receiver, the servos and the electronic speed controller (ESC).
- Carry out all wiring and soldering **with the battery disconnected**.
- Servos powered from the **+** row must tolerate the same voltage as the receiver. The power source (BEC) must be able to supply the current for all servos at the same time.

1.3 Operating the model

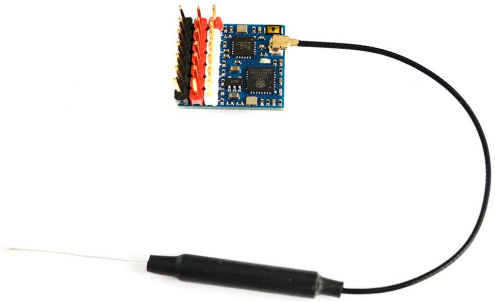
- Before every use, check the range and the correct function of all control surfaces and the power system (chapter 6.1).
- Before first use, set and test the **failsafe** (chapter 5.5) – if the signal is lost, the model must go to a safe state; in particular, the throttle must be closed.
- When connecting the battery to a model with an electric motor, keep hands and objects clear of the propeller. Remove the propeller when setting up on the bench.
- Only operate the model where you do not endanger people, animals or property, and in accordance with the rules given in chapter 3.

2. Product description

2.1 What the receiver is for

The Matek ELRS-R24-P6 is a miniature **ExpressLRS** receiver for the 2.4 GHz band with **six PWM outputs**. Servos and the speed controller connect to it directly, without a flight controller (FC). It is particularly suitable for smaller model aircraft, but also for other servo-controlled models.

The receiver has a **VBat** solder pad for measuring the voltage of a 2S–8S flight battery, which it sends back to the radio via telemetry. The antenna connects via an IPEX MHF1 connector. The receiver works with any ExpressLRS 2.4 GHz transmitter module running the same major firmware version and the same binding phrase.



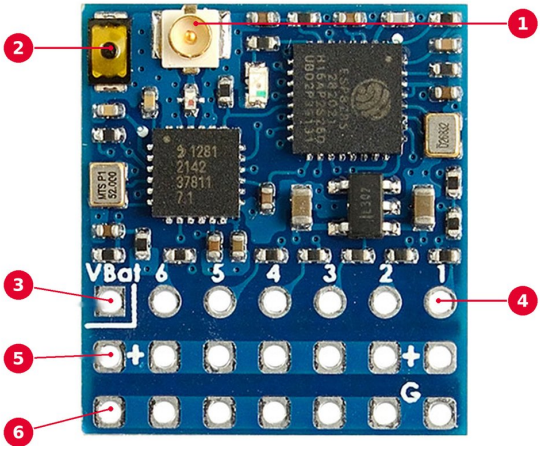
ELRS-R24-P6 receiver with antenna and soldered pin header

2.2 Package contents

- 1× ELRS-R24-P6 receiver
- 1× antenna with IPEX MHF1 connector, length 15 cm
- Dupont pin header, 2.54 mm pitch (not soldered)

※ The receiver is supplied with the pin header not soldered. Servos, speed controller, power supply (BEC), battery and a radio with an ExpressLRS module are not included.

2.3 Receiver layout



Top side of the receiver

① IPEX MHF1 antenna connector

② Boot button (firmware update, see chapter 5.6)

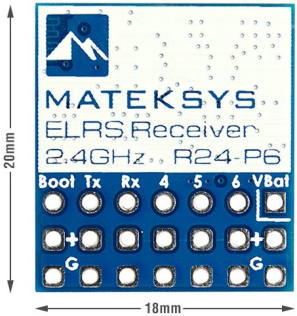
③ **VBat** pad – battery voltage sensing input, max. 34 V

④ Signal outputs **1–6** (PWM)

⑤ Power row **+** – input 4–9 V DC; all pads in the row are connected

⑥ Row **G** – ground (GND)

The board also carries a status LED. On the underside of the board, the signal pads of outputs 1, 2 and 3 are labelled **Boot**, **Tx** and **Rx** – the Tx and Rx pads are used to connect a USB-TTL adapter when updating the firmware (chapter 5.6).



Underside of the receiver with board dimensions

2.4 Specifications

Parameter	Value
Designation	Matek ELRS-R24-P6
System	ExpressLRS 2.4 GHz
Chips	ESP8285, SX1281
Frequency band	2.4 GHz (2400–2480 MHz)
Telemetry power	12 dBm
Outputs	6× PWM
Supply voltage	4–9 V DC (+ row)
VBat voltage sensing	2S–8S, max. 34 V
Current draw	45 mA (binding), 85 mA (WiFi mode)
Antenna connector	IPEX MHF1
Antenna	15 cm
Board dimensions	20 × 18 mm
Weight	2 g (with antenna)
Firmware target	Generic ESP8285 6xPWM 2.4Ghz RX or HappyModel EPW6 2.4GHz PWM RX
Firmware update	via WiFi or UART

Data provided by the manufacturer Matek Systems.

3. Legal conditions of operation

3.1 The law of the country of operation applies

European Union rules on radio equipment and unmanned aircraft apply in all member states, but national implementing rules differ from country to country – permitted frequency bands, maximum transmit power, operator registration, minimum pilot age, geographical zones and compulsory insurance. The information in this chapter describes the situation in the Czech Republic. If you operate the model in another country, **you must comply with the regulations of the country in which you operate it**.

3.2 Radio frequencies and transmitted power

- The receiver operates in the **2400–2480 MHz** band and, in addition to receiving, transmits telemetry itself at **12 dBm** (manufacturer's data).
- The power of the control signal is set on the ExpressLRS transmitter module in the radio. The user is responsible for ensuring that the set power and the selected mode comply with the regulations of the country of operation.
- In the Czech Republic, operation of equipment in the 2.4 GHz band is governed by the general authorisations of the Czech Telecommunication Office (www.ctu.cz).

3.3 Operating model aircraft

Under EU law, a model aircraft is an unmanned aircraft and its operation is governed by Commission Implementing Regulation (EU) 2019/947. Before flying, check your obligations – in particular operator registration, pilot competency, operational limits (height, visual line of sight, distance from people) and geographical zones. In the Czech Republic, the rules are published by the Civil Aviation Authority (www.caa.gov.cz).

4. Installation and wiring

4.1 Soldering the pin header

The receiver is supplied with an unsoldered pin header with 2.54 mm pitch. Solder the header according to how the receiver will be mounted in the model – servos are then connected with standard Dupont / JR / Futaba connectors.

① Break off the required number of pins from the header (three rows: signal, +, G).

② Insert the header into the holes in the board and first solder one pin in each row. Check that the header is perpendicular, and only then solder the remaining pins.

③ Solder quickly so that nearby components are not damaged. The **VBat** pad is usually fitted with a separate wire, not a pin.

④ After soldering, check that no solder bridges adjacent pads.

4.2 Connecting servos, ESC and power

- Connect the servo or ESC lead to the chosen output so that the **signal wire** (usually white, yellow or orange) is on the signal row 1–6, the **positive wire** (red) on the **+** row and the **negative wire** (black or brown) on the **G** row.
- By default, the radio channel corresponds to the output number (channel 1 → output 1, etc.). The speed controller is usually connected to output 3 (throttle) – output 3 also has a different default failsafe value (chapter 5.5).
- Supply 4–9 V to the **+** and **G** rows – most often from the speed controller's BEC via its servo lead, or from a separate BEC.
- Always power the receiver from **one** source only. If two speed controllers in the model have a BEC, disconnect the positive wire of the second one.

4.3 Battery voltage sensing (VBat)

To monitor the flight battery voltage on the radio, connect the **VBat** pad with a wire to the positive terminal of the battery (e.g. to the power input of the speed controller). Ground is shared via the **G** row.

※ No more than 34 V may be applied to the VBat pad (2S–8S battery). The VBat pad does not power the receiver – power must always be supplied to the + row.

4.4 Antenna

- Fit the IPEX MHF1 antenna connector straight and carefully, without levering – it is fragile. Secure the cable so that it does not pull on the connector.
- Route the active end of the antenna (the thin unshielded wire at the end) as far as possible from carbon parts, metal parts, the motor and the battery.
- Do not shorten the antenna or bend it sharply. Replace a damaged antenna.
- Do not power the receiver without the antenna connected.

5. Setup

5.1 ExpressLRS firmware and binding phrase

An ExpressLRS receiver and transmitter module will only connect if they have the **same major firmware version** and the **same binding phrase**. According to the manufacturer, the receiver is factory-loaded with ExpressLRS firmware with the binding phrase **“123456”**. It therefore **will not enter binding mode using the traditional procedure** (repeated power cycling).

Set the binding phrase in one of the following ways:

- in the receiver's web interface via WiFi (chapters 5.2 and 5.3), or
- by flashing firmware with your binding phrase using ExpressLRS Configurator (via WiFi or UART, chapter 5.6).

In ExpressLRS Configurator, select the target **Generic ESP8285 6xPWM 2.4Ghz RX** or **HappyModel EPW6 2.4GHz PWM RX**.

5.2 WiFi mode and web interface

① Disconnect the speed controller and servos from the receiver.

② Switch off the radio (transmitter module) and power the receiver from a 5 V source.

③ The receiver LED first blinks slowly. According to the manufacturer, after about 20 seconds it starts blinking fast – the receiver is in WiFi mode and creates a network (hotspot). The time until WiFi starts depends on the firmware settings.

④ Connect a computer or phone to the **ExpressLRS RX** network, password **expresslrs**.

⑤ Open **http://10.0.0.1/** in a browser.

WiFi mode can also be enabled from the radio if the receiver is already connected: in the ExpressLRS (Lua) script, select *Wifi Connectivity → Enable RX WiFi*. If your home WiFi network is stored in the receiver, the hotspot will not appear and the web interface can be found at **http://elrs_rx.local**.

5.3 Binding to the transmitter module

① In the receiver's web interface, enter the same phrase as used by your transmitter module in the **Binding Phrase** field (on the *Binding* or *Options* tab, depending on the firmware version) and save the setting.

② Switch the receiver off and on again.

③ Switch on the radio with the ExpressLRS module. If the receiver LED is solid, the receiver is connected to the transmitter module.

④ Move the sticks and check that the servos respond on the correct outputs and in the correct direction. Set direction and travel on the radio.

5.4 Output settings

In the receiver's web interface you can set, for each output, which radio channel it carries and the output mode. According to the ExpressLRS documentation, the following are available in particular:

- **channel mapping** – any channel to any output, one channel also to several outputs,
- **PWM frequency** 50, 60, 100, 160, 333 or 400 Hz – run analogue servos at 50 Hz, use higher frequencies only with servos and ESCs that support them,
- **pulse width** – normal 988–2012 µs (centre 1500 µs) or extended 885–2115 µs,
- other modes, e.g. on/off output or serial output (CRSF, SBUS).

In ExpressLRS, channels 1–4 have full resolution. Channel 5 (AUX1) is a two-position channel used as the Arm switch – do not assign it to a servo output. If you need servos on further channels, select a higher-resolution switch mode (*Switch Mode*) in the ExpressLRS script, e.g. *Wide*.

5.5 Failsafe

Failsafe is the state to which the receiver switches its outputs when the signal from the radio is lost. Failsafe values (988–2012 µs) are set for each output in the receiver's web interface. According to the ExpressLRS documentation, the default value is 1500 µs (centre) on all outputs except **output 3**, where it is **988 µs** (throttle closed).

- After power-up, the receiver generates no pulses on its outputs until it connects to the radio.
- If the speed controller is on an output other than 3, set the failsafe of that output to a value at which the motor stops.
- Always test the failsafe with the propeller removed: switch on the model, switch off the radio and check that the motor stops and the control surfaces move to the set position.

5.6 Firmware update via UART

The firmware can be updated via WiFi (you upload the file in the web interface, or ExpressLRS Configurator sends it) or via a USB-TTL adapter. The UART procedure is also used to recover a receiver that cannot be updated via WiFi.

① Disconnect the speed controller and servos from the receiver.

② Connect the USB-TTL adapter: the receiver's **Tx** pad to the adapter's **RX**, the receiver's **Rx** pad to the adapter's **TX**, the adapter's **5 V** to the **+** row and **GND** to the **G** row.

③ Press the **Boot** button, connect power (plug the adapter into USB) and release the button. The receiver LED is solid.

④ In ExpressLRS Configurator, select the target **HappyModel EPW6 2.4GHz PWM RX** and the **UART** flashing method, enter the binding phrase and other firmware options, tick *Erase before flash* and *Force Flash* and start flashing.

5.7 Further guides

A detailed description of the ExpressLRS system, the web interface and the script on the radio can be found in the official ExpressLRS documentation at www.expresslrs.org. Manufacturer's page of the receiver: www.mateksys.com.

6. Operation

6.1 Check before every use

- The radio and the model's batteries are charged.
- The receiver antenna is undamaged, correctly connected and routed away from conductive parts.
- Servo and power connectors are secure; no wire is damaged.
- After power-up, the receiver LED is solid (link established) and all control surfaces respond in the correct direction.
- The throttle is at zero and the failsafe has been tested.
- Carry out a range check – with the model on the ground, walk away and verify that control works reliably.

6.2 Telemetry

The receiver sends telemetry to the radio with link quality data and – if the VBat pad is connected – the battery voltage. Set up voice or audio alerts on the radio for a weak signal and low battery voltage, and land the model without delay when an alert sounds.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- After a crash, check the board, the solder joints, the antenna connector and the antenna.
- Keep the receiver dry and clean. Remove dirt with a dry soft brush.
- Store in a dry place, away from direct sunlight and heat sources.

7.2 Troubleshooting

Problem	Cause and solution
Receiver does not connect to the radio	Different binding phrase or major firmware version on the receiver and transmitter module. Set the same binding phrase (chapter 5.3), or align the firmware.
Traditional binding does not work	The receiver has a factory-set binding phrase and does not enter binding mode the traditional way. Use the web interface (chapter 5.2).
ExpressLRS RX hotspot does not appear	The radio is on and the receiver has connected to it, or a home WiFi network is stored (address http://elrs_rx.local). Switch off the radio and wait longer.
Servo does not respond or jitters	Check connector orientation, channel mapping and PWM frequency (analogue servos 50 Hz).
Receiver reboots when servos move	The BEC cannot supply enough current for the servos. Use a more powerful BEC.
Short range	Damaged or poorly routed antenna, low transmitter module power.
WiFi update failed	Recover the receiver by updating via UART (chapter 5.6).

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 (ELRS-R24-P6) is given on the label on the underside of the receiver board.

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.