ELRS-R24-P6V

Matek ExpressLRS 2.4 GHz PWM Vario receiver with antenna diversity
User Manual



Read the entire manual before installation. The receiver is supplied with unsoldered pin headers. Reverse polarity on the power supply will destroy the receiver.

www.rotorama.com

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1. Safety instructions

1.1 Before you start

The Matek ELRS-R24-P6V is a radio receiver for controlling RC models (aircraft, gliders, drones and others) using the ExpressLRS system in the 2.4 GHz band. The receiver drives servos and electronic speed controllers (ESC) and therefore the movement of the model. Incorrect installation or configuration may lead to loss of control of the model, a crash, damage to property or injury to persons.

- This product is not a toy and is not intended for children. Installation should be carried out by a user with basic experience of soldering and RC model electronics.
- Before installation, read this entire manual as well as the manuals for the radio, transmitter module, servos and ESC.
- The receiver is supplied **with unsoldered pin headers**. Solder on a non-flammable surface, in a well-ventilated area and wear eye protection.
- Protect the electronics against electrostatic discharge – hold the board by its edges and do not touch the components.

1.2 Power supply and wiring

Reverse polarity on the power supply will destroy the receiver's voltage regulator. Always double-check the polarity of the power wires before connecting power for the first time.

- Power the receiver only with a DC voltage of **4–13 V** applied to the row of **V** pins (positive) and **G** pins (negative, ground).
- A maximum of **25.5 V** may be applied to the **VBat** pad. Do not use the VBat pad to power the receiver – it is for voltage sensing only.
- Do not short-circuit the receiver's pins and pads. Before connecting the battery, check the wiring so that adjacent pins or wires do not touch.
- Disconnect power before connecting or disconnecting servos or the ESC. When updating the firmware via UART, disconnect the ESC and the servos.

1.3 Operating the model

- When setting up on the ground and whenever working on an electric-powered model, remove the propeller or secure it – the motor may start unexpectedly.
- Before every flight, check the control surface response and the failsafe function (chapter 5.5) and carry out a pre-flight check (chapter 6.1).
- Fly only where it is permitted, away from people, animals, buildings, roads and high-voltage power lines.
- Do not use the receiver in a model that is damaged, wet or has loose connections.

2. Product description

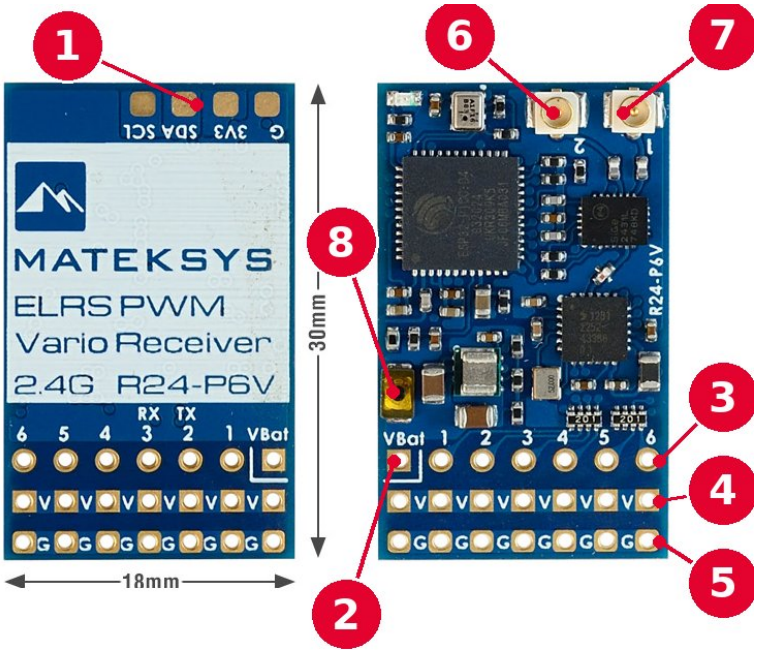
The ELRS-R24-P6V is a six-channel ExpressLRS 2.4 GHz receiver with direct PWM outputs for servos and ESCs. It features switched antenna diversity with two antennas, a built-in SPL06-001 barometer (vario) and flight battery voltage sensing. Vario data, battery voltage and link quality are sent to the radio via telemetry. It is particularly suitable for gliders and other model aircraft.

2.1 Package contents

Qty	Item
1	Matek ELRS-R24-P6V receiver
2	Antenna with IPEX MHF-1 connector, length 15 cm
–	Dupont pin headers, 2.54 mm pitch (the board is shipped unsoldered)

The package does **not** include a radio or ExpressLRS transmitter module, power supply (BEC), servos, ESC or connecting cables.

2.2 Parts description



Both sides of the receiver (dimensions 30 × 18 mm)

① I²C and 3.3 V power pads – **SCL**, **SDA**, **3V3**, **G**.

② **VBat** pad – flight battery voltage sensing input, max. 25.5 V.

③ Signal pins of outputs **1–6** (PWM). Pins 2 and 3 are also marked **TX** and **RX** (UART serial interface).

④ **V** row – receiver power input 4–13 V DC.

⑤ **G** row – ground (negative).

⑥ Antenna connector **2** (IPEX MHF-1).

⑦ Antenna connector **1** (IPEX MHF-1) – default diversity antenna.

⑧ **BOOT** button – for firmware update via UART.

2.3 Specifications

MCU / RF chip	ESP32-PICO-D4, SX1281
PA/LNA	SE2431L
Firmware	ExpressLRS
Frequency band	2.4 GHz ISM
Telemetry power	22.5 dBm (180 mW)
Diversity	antenna switching, default ANT1
Barometer (vario)	SPL06-001
Outputs	6× PWM
VBat voltage sensing	0–25.5 V
Antenna connector	IPEX MHF-1
Power supply	4–13 V DC on V pins
Current consumption	60–80 mA at 5 V input
PCB size	30 × 18 mm
Weight	4 g including antennas
Firmware target	Generic ESP32 PWM Vario 2.4Ghz RX, or RadioMaster ER6-GV or RadioMaster ER6-G

Data according to the manufacturer Matek Systems.

3. Legal requirements in the Czech Republic and the EU

3.1 The law of the country of operation applies

European Union regulations on radio equipment and on the operation of unmanned aircraft apply in all member states, but national implementing rules differ from country to country – permitted frequency bands, maximum transmit power, registration portals, geographical zones and mandatory 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 transmit power

The receiver operates in the 2.4 GHz ISM band. In addition to receiving commands, it transmits telemetry back; the manufacturer specifies a telemetry power of **22.5 dBm (180 mW)**. For configuration and firmware updates, the receiver also transmits on 2.4 GHz WiFi (its own access point).

In the Czech Republic, operation of equipment in the 2400–2483.5 MHz band 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

- The limits apply to **e.i.r.p.**, i.e. including antenna gain. The maximum telemetry power specified by the manufacturer exceeds these limits.
- **The user is responsible for the transmit power setting.** Set the receiver's telemetry power to comply with the regulations of the country of operation (chapter 5.7). The same applies to the power of the transmitter module in the radio.
- Operate the receiver only with the antennas specified by the manufacturer and do not modify the device electrically or mechanically.
- When building the firmware, select the regulatory domain appropriate for the country of operation (chapter 5.8).

3.3 Operating models and drones

The receiver itself is not an unmanned aircraft, but the model or drone in which you install it is subject to Regulation (EU) 2019/947 and national regulations. Before flying, check whether you must register as an operator, what competency you need and in which zones you may fly. In the Czech Republic, this information is provided by the Civil Aviation Authority (www.caa.cz). You can also fly within a model aircraft club under its operating rules.

4. Installation

4.1 What else you need

- A radio with an **ExpressLRS 2.4 GHz** transmitter module (internal or external). The manufacturer recommends up-to-date EdgeTX or OpenTX radio firmware. The major version number of the ExpressLRS firmware in the transmitter module and in the receiver must match.
- A 4–13 V power supply for the receiver and servos – typically the ESC's BEC or a separate BEC.
- Servos and an ESC with 2.54 mm pitch connectors.
- A soldering station and solder for the pin headers or wires.
- A phone or computer with 2.4 GHz WiFi for configuring the receiver via the web interface.

4.2 Soldering the pin headers

The receiver board is supplied without soldered pins. Solder the Dupont pin headers from the package into the signal / V / G rows of holes according to how you want to connect the servos – the headers can point straight up or be bent to the side for a lower installation height. Instead of headers, wires can be soldered directly into the holes.

- Solder quickly and cleanly to avoid solder bridges between adjacent holes.
- After soldering, check with a magnifier that adjacent pins do not touch and measure that there is no short circuit between the V and G rows.
- Solder the pads ① (I^2C) and ② (VBat) only if you use them.

4.3 Power supply and servo connection

- Connect the 4–13 V DC supply to the **V** row (positive) and **G** row (negative). Double-check the polarity before switching on for the first time.
- Connect the servos and ESC to outputs 1–6: signal wire to the numbered row, positive wire to the V row, negative wire to the G row.
- Servos connected to the pin headers are powered from the V row. Make sure the supply voltage suits the servos as well as the 4–13 V range and that the supply can handle the current draw of all servos.
- The default mapping is straight through: channel 1 from the radio goes to output 1, channel 2 to output 2, etc. Output 3 is set up for throttle by default (see chapter 5.5).

4.4 Flight battery voltage sensing (VBat)

To monitor the flight battery voltage on your radio, connect the battery's positive terminal to the **VBat** pad ② with a thin wire. The battery ground must be common with the receiver ground (G). The measuring range is **0–25.5 V**.

The voltage on the VBat pad must not exceed 25.5 V. Do not use the VBat pad to power the receiver.

4.5 Antennas and placement in the model

- Connect both antennas to the IPEX MHF-1 connectors ⑥ and ⑦. Press the connector on perpendicularly and gently; do not pull on the cable.
- Route the active antenna ends (the unshielded part at the end) away from carbon parts, metal parts, power wires and the battery. Carbon and metal block the signal.
- Orient each antenna in a different direction (e.g. at a right angle) so that diversity is effective, and secure them against shifting, bending and contact with the propeller.
- Mount the receiver using a damping pad or double-sided foam tape, away from the ESC and high-current wires. You can protect the board with heat-shrink tubing – the BOOT button must not remain pressed.

5. Setup

5.1 WiFi mode and web interface (WebUI)

The receiver is configured via its own web interface (WebUI), available in WiFi mode. Some settings can also be changed from the radio using the ExpressLRS Lua script when the receiver is connected to the transmitter.

① Switch off the radio and power up the receiver. The red LED first blinks slowly (waiting for the transmitter).

② If the receiver does not connect to a transmitter, it switches to WiFi mode after about 30 s – the LED starts blinking fast. If the receiver is connected, WiFi mode can also be enabled in the Lua script: *ExpressLRS → WiFi Connectivity → Enable RX WiFi*.

③ Connect your phone or computer to the WiFi network **ExpressLRS RX**, password **expresslrs**. Keep the device close to the receiver – its WiFi antenna has a short range.

④ Open **http://10.0.0.1** in your browser. If the phone offers a network login page, close it and enter the address manually; allow the phone to use the network without internet access.

The WebUI has tabs for receiver information (*Information*), binding (*Binding*), output settings (*Connections*/*Model*), WiFi and firmware update (*Update*). Do not change the *Hardware Layout* tab unless you know exactly what you are doing.

5.2 Binding to the transmitter (binding phrase)

The receiver is supplied with ExpressLRS firmware preloaded and with the factory binding phrase **“123456”**. According to the manufacturer, the receiver in its factory state therefore **will not enter binding mode** using the traditional procedure. Set the binding phrase in one of two ways:

- **Via the WebUI** – in WiFi mode open the *Binding* tab, enter the same binding phrase as your transmitter module and save the setting.
- **By flashing firmware** with your chosen binding phrase (chapter 5.8).

Choose a unique phrase, ideally at least 8 alphanumeric characters of the Latin alphabet (for example your pilot handle). The phrase is not for security but to prevent your receiver from connecting to someone else's transmitter with the same phrase. After the radio and receiver are switched on, devices with the same phrase connect automatically – the receiver LED is solid and a **C** (connected) appears in the top right corner of the Lua script.

※ If the LED blinks three times followed by a pause, the receiver is connected but the *Model Match* setting (model ID) does not match. Set the correct model ID on the radio or disable *Model Match*.

5.3 Output mapping and modes

Channel mapping is set in the WebUI (PWM output table) or in the Lua script under *Other Devices → Output Mapping*. Any input channel can be assigned to any output and one channel can be used for several outputs. For each output you can set:

- **Input Ch** – which radio channel is sent to the output,
- **Output Mode** – PWM refresh rate of 50, 60, 100, 160, 333 or 400 Hz (depending on what the servo supports), 10 kHz PWM with 0–100 % duty cycle (e.g. for switching a brushed motor), binary On/Off output, DSHOT300 for brushless motor ESCs, or serial output (Serial TX/RX) on pins that support it,
- **Invert** – inverting the output,
- pulse width – normal (988–2012 µs, centre 1500 µs), extended (885–2115 µs) or half (494–1006 µs, centre 750 µs) for servos that require it.

Besides PWM, the receiver can output a serial protocol such as CRSF or SBUS on pins 2 (TX) and 3 (RX) – for example for a stabiliser unit. The protocol is selected in the WebUI on the *Model* tab or in the Lua script (*Other Devices → Protocol*).

5.4 Channel resolution and switch mode

The PWM outputs are subject to the resolution of the ExpressLRS protocol. In the default switch modes (*Hybrid*, *Wide*), only channels 1–4 have full 10-bit resolution; channel 5 (AUX1) is two-position and is used for Arm (enabling the motors), the other channels have reduced resolution and slower updates.

The manufacturer and the ExpressLRS documentation therefore recommend the **Full Resolution** modes (8ch, 12ch Mixed, 16ch Rate/2) for PWM receivers with more than 4 channels; they are available at the 100 Hz Full and 333 Hz Full packet rates. The switch mode and packet rate are changed in the transmitter's Lua script, and only when the receiver is **not connected** to the transmitter: switch off the receiver, wait for the “Telemetry Lost” callout, change the setting and switch the receiver on again.

※ If you want to use output 5 for a servo while channel 5 is used for Arm, map another channel to output 5.

5.5 Failsafe

Failsafe is the state the receiver enters when the signal is lost: if the link quality (LQ) drops to 0 or no valid channels packet is received for 1 s, whichever comes first. The PWM outputs are then set to the failsafe positions.

- The default failsafe position is **1500 µs** for all outputs except output 3, which defaults to **988 µs** (throttle).
- Set the failsafe positions in the WebUI within the range 988–2012 µs, or in the Lua script with the *Set Failsafe Pos* button – the Lua script stores the current channel positions.

- After power-up, the receiver generates no pulses until it connects to a transmitter. This allows ESC calibration using the usual method (throttle high before connecting).

Set the failsafe positions so that the model safely shuts off the motor when the signal is lost, and test the function before the first flight – with the propeller removed, switch off the radio and watch the response of the servos and motor.

5.6 Telemetry, vario and voltage

The receiver sends link quality and signal strength to the radio, data from the built-in barometer (altitude relative to the power-up location and vertical speed for the vario) and the voltage measured on the VBat pad. On an EdgeTX radio, open the model's telemetry page and select *Discover new sensors*; the sensors will gradually appear in the list.

- The telemetry update rate depends on the packet rate and the telemetry ratio (*TLM Ratio*) in the Lua script. At a low ratio (e.g. 1:64), values may take several seconds to update.
- Altitude is measured from the place where you powered up the receiver. Therefore power up the receiver at the take-off location.
- Change the voltage measurement calibration in the WebUI only if you know exactly what you are doing.

5.7 Telemetry power

The receiver has a power amplifier, so the telemetry power (*Tlm Power*) can be set in the Lua script. The **MatchTX** option sets the telemetry power according to the power reported by the transmitter module; this information is only transmitted in the *Wide* switch mode or in the Full Resolution modes. Until it is received, the receiver transmits at its default power (usually maximum).

Set the telemetry power and the transmitter module power to comply with the regulations of the country of operation (chapter 3.2).

5.8 Firmware update

Firmware is built in the **ExpressLRS Configurator** or in the Web Flasher tool (expresslrs.github.io/web-flasher). Select **Generic ESP32 PWM Vario 2.4Ghz RX** or **RadioMaster ER6-GV** as the target. In the firmware options, set the regulatory domain for the country of operation, your binding phrase and optionally your home WiFi credentials.

▶ **Update via WiFi**

① In the Configurator, select the *WiFi* method and build the firmware (*Build*). Do not unpack the resulting *firmware.bin.gz* file.

② Switch the receiver to WiFi mode and open the WebUI (chapter 5.1).

③ On the *Update* tab, select the firmware file and start the update.

④ Wait for the success message. Do not disconnect power until the LED starts blinking again.

▶ **Update via UART**

① Disconnect the ESC and servos from the receiver.

② Connect a USB-TTL adapter: receiver pin **TX (output 2)** to RX of the adapter, pin **RX (output 3)** to TX of the adapter, 5 V of the adapter to the V row and GND to the G row.

③ Hold down the BOOT button ⑧, connect power and release the button. The red LED is solid – the receiver is in bootloader mode.

④ In the Configurator, select the target, the *UART* method, the binding phrase and firmware options, tick *Erase before flash* and *Force Flash* and start flashing.

5.9 Further guides

Detailed information on the ExpressLRS system and the EdgeTX radio firmware can be found on the official websites www.expresslrs.org and www.edgetx.org.

6. Before flight

6.1 Pre-flight check

- The model's flight battery is fully charged and in good condition, the receiver supply is within 4–13 V.
- The antennas are connected, undamaged and correctly routed; the receiver is firmly mounted.
- The radio and receiver are connected (receiver LED solid), the correct model is selected on the radio.
- The control surfaces move in the correct direction and over their full range, nothing binds.
- Failsafe is set and tested (chapter 5.5).
- Telemetry reports signal strength, link quality and battery voltage.
- Before the first flight of a new model, carry out a range check on the ground – control of the model at a sufficient distance must work reliably.
- The power of the transmitter module and of telemetry complies with the regulations of the country of operation.

7. Maintenance and troubleshooting

7.1 LED indication

Red LED	Receiver status
solid on	connected to transmitter, or bootloader mode (BOOT)
slow blink (500 ms)	waiting for connection from transmitter
double blink then pause	binding mode
triple blink then pause	connected, but Model Match mismatch
medium blink (100 ms)	radio chip not detected
fast blink (25 ms)	WiFi mode

7.2 Troubleshooting

Problem	Cause and solution
Receiver does not connect to the transmitter	Different binding phrase – set the same phrase in the WebUI (chapter 5.2). Major ExpressLRS version number in the transmitter module and receiver does not match – update the firmware. Different regulatory domain of transmitter and receiver.
Traditional binding does not work	In its factory state the receiver has the phrase “123456” set – set your own phrase in the WebUI or flash firmware with a phrase.

Problem	Cause and solution
LED does not blink, solid right after power-up	The BOOT button is permanently pressed (e.g. by heat-shrink tubing), or the receiver remained in the bootloader after a failed update – flash the firmware via UART.
Cannot find the ExpressLRS RX network	The receiver is not yet in WiFi mode (the LED must blink fast). Move the phone closer to the receiver. If you have set up home WiFi, the receiver has connected to it – open http://elrs_rx.local.
Output 5 behaves like a switch	Channel 5 is two-position (Arm). Remap the output or use a Full Resolution mode (chapter 5.4).
Switch mode change is not saved	The mode can only be changed while the receiver is not connected – switch off the receiver and wait for “Telemetry Lost”.
Altitude or voltage missing on the radio	Run *Discover new sensors*. Check the VBat pad wiring and the telemetry ratio.
Short range	Antennas are shielded by carbon or metal, damaged or poorly connected. Check the transmitter module power.

7.3 Maintenance and storage

- After a crash, check the antennas, IPEX connectors and solder joints; replace damaged antennas with a type with an IPEX MHF-1 connector.
- Protect the receiver from moisture, dust, dirt and vibration. Do not clean it with water or solvents.
- Store in a dry place, at room temperature and in an antistatic bag.

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 (R24-P6V) is printed on the receiver board; the firmware version can be found in the receiver's web interface on the *Information* tab.

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 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.