Cement ELRS 2.4G

DarwinFPV – ExpressLRS 2.4 GHz receiver
User manual



Read this entire manual carefully before installation and first use, and keep it for future reference.

Rotorama, s.r.o. · www.rotorama.com

Contents

1. Safety instructions
2. Product description
3. Legal conditions of operation
4. Installation
5. Binding and operation
6. Firmware, WiFi and further guides
7. Maintenance and troubleshooting
8. Information for the EU and Czech market
9. Warranty and rights arising from defective performance

1. Safety instructions

1.1 Before you start

- The receiver is designed to be installed in radio-controlled models, in particular FPV drones. Installation requires soldering, basic knowledge of electronics and the ability to configure the flight controller (FC).
- During installation, configuration, binding and bench testing, **always remove the propellers from the motors**. An unexpected motor start can cause serious injury.
- This product is not a toy. It contains small parts and is not intended for children. Keep it out of their reach.
- Do not tamper with the receiver and do not remove its protective potting compound – doing so destroys its durability and may damage the electronics.

1.2 Electrical connection

- Power the receiver **only with 5 V** from a regulated output of the flight controller. Never connect it directly to the flight battery.
- Solder and connect only with the battery and the USB cable disconnected. Make sure there is no solder bridge between adjacent pads.
- The manufacturer states that the receiver has power reverse-polarity protection. This protection does not replace checking the wiring – always check the wiring according to chapter 4.1 before connecting the battery for the first time.
- Do not bend the antenna cable at sharp angles, do not pinch it and do not use the receiver with a damaged antenna.

1.3 Operating environment and durability

- The manufacturer specifies an ingress protection rating of **IP67** for the receiver (dust-tight, protected against the effects of temporary immersion in water). The rating applies to the receiver itself – **it does not cover the flight controller, the other electronics of the drone or the solder joints**.
- After flying in rain, snow, dew or mud, disconnect the battery from the drone immediately, clean the drone and let it dry thoroughly.
- The receiver is part of the model's control link. Before every flight, check that the model responds to commands, and observe the operating rules given in chapter 3.

2. Product description

2.1 Intended use

The DarwinFPV “Cement” ELRS 2.4G is an **ExpressLRS** (ELRS) receiver for the 2.4 GHz band, designed for FPV drones. It receives control commands from an ExpressLRS 2.4 GHz radio or transmitter module and passes them to the flight controller using the CRSF protocol. It sends telemetry back to the radio.

The entire receiver is encapsulated in a protective potting compound. The manufacturer specifies an IP67 ingress protection rating, power reverse-polarity protection and a built-in 100 mW power amplifier (PA) for telemetry.



Receiver with Mini T antenna
(manufacturer's illustration photo)

2.2 Package contents

Item	Qty
DarwinFPV “Cement” ELRS 2.4G receiver with Mini T antenna (50 mm)	1×
Silicone cable (length 70 mm)	1×
Transparent heat-shrink tube (length 50 mm, diameter 14 mm)	1×

Not included: flight controller, ExpressLRS 2.4 GHz radio or transmitter module, soldering supplies and cable ties.

2.3 Technical data

Designation	DarwinFPV “Cement” Ultra Durable ELRS 2.4G Receiver
System	ExpressLRS (ELRS), 2.4 GHz ISM
Protocol to flight controller	CRSF
Supply voltage	5 V
Current consumption	60 mA
Telemetry power (RF)	100 mW
Chips	ESP8285, SX128X, AT2401C
Firmware target	BETAFPV_Nano_2400_RX
Antenna	Mini T, 50 mm
Dimensions	14.2 × 22.0 × 4 mm
Weight	3.0 g ± 0.2 g
Ingress protection	IP67 (manufacturer's data)
Protection	power reverse-polarity protection

2.4 Receiver overview

On the short edge of the receiver there are four solder pads: **RX, TX, 5V and GND**. The antenna cable with the Mini T antenna exits from the opposite edge.



Both sides of the receiver (manufacturer's illustration photo)

3. Legal conditions of operation

3.1 The law of the country of operation applies

European Union rules on radio equipment and on the operation of unmanned aircraft – Directive 2014/53/EU and Regulation (EU) 2019/947 – apply in all Member States, but the national implementing rules differ from country to country: permitted frequency bands, maximum transmit power, registration portals, minimum pilot age, 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 follow the regulations of the country in which you operate it.

3.2 Radio frequencies and transmit power

Frequency band	2.4 GHz ISM (2400–2483.5 MHz)
ELRS radio link	reception of control commands and transmission of telemetry
Max. telemetry power	100 mW (manufacturer's data)
WiFi mode	2.4 GHz, only for configuration and firmware updates (chapter 6.1)

In the Czech Republic, use of the 2400–2483.5 MHz band is regulated by the Czech Telecommunication Office (ČTÚ) in general authorisations. General authorisation **VO-R/10** (short-range devices) permits a maximum of **25 mW e.i.r.p.** in this band, general authorisation **VO-R/12** (wideband data transmission) a maximum of **100 mW e.i.r.p.** The current wording is available at www.ctu.cz.

❖ The user is responsible for setting the transmit power of the radio and the telemetry power of the receiver (chapter 6.3). Outside the Czech Republic, the limits of the country in which you operate the model apply.

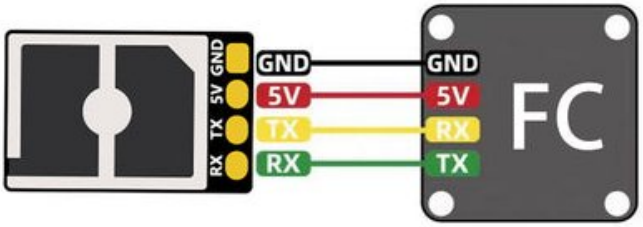
3.3 Drone operation

In the EU, operation of the drone in which you install the receiver is governed by Implementing Regulation (EU) 2019/947. The operator of a drone with a camera must register (in the Czech Republic with the Civil Aviation Authority, www.caa.gov.cz) regardless of the drone's weight and display the registration number on the drone. Observe the operating limits of the open category, in particular flying within visual line of sight (VLOS) and a maximum height of 120 m. When flying with FPV goggles, an unmanned aircraft observer must stand next to the pilot.

4. Installation

4.1 Connecting to the flight controller

Connect the receiver to a free, full serial port (UART) of the flight controller. The signal wires are **crossed**: the receiver's TX goes to the flight controller's RX and the receiver's RX goes to TX of the same UART.



Wiring diagram of the receiver to the flight controller (according to the manufacturer)

Receiver pad	Flight controller pad
GND	GND (ground)
5V	5 V output
TX	RX of the selected UART (e.g. RX2)
RX	TX of the same UART (e.g. TX2)

❖ Do not use a UART dedicated to SBUS receivers (with an inverter or a pull-down resistor on RX). According to the ExpressLRS documentation, the receiver will not establish a link on it and its LED will stay solid.

4.2 Placing the receiver and antenna

- Place the receiver as far as possible from the video transmitter (VTX), the electronic speed controllers (ESC) and the power wires.
- Route the elements of the Mini T antenna outside the frame so that they are not shielded by carbon parts or the battery. Carbon fibre and metal significantly attenuate the signal.
- Secure the antenna so that it cannot get into the propellers – for example with a cable tie or heat-shrink tube to an arm or a standoff.
- Route the antenna cable loosely, without sharp bends and without tension.
- After connecting, you can use the supplied transparent heat-shrink tube to cover the receiver including the solder joints and to secure it.

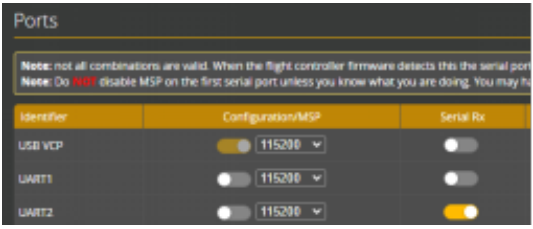
4.3 Configuration in Betaflight

① Connect the flight controller to the computer and open *Betaflight Configurator*.

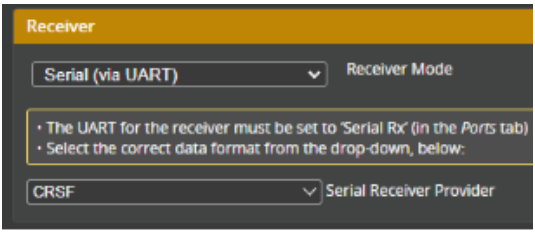
② On the *Ports* tab, enable the *Serial Rx* switch for the UART to which the receiver is connected (UART2 in the picture). Save and reboot (*Save and Reboot*).

③ On the *Receiver* tab, select the *Serial (via UART)* mode and choose **CRSF** under *Serial Receiver Provider*. Save.

④ The ExpressLRS documentation further recommends enabling telemetry (*Telemetry*), disabling *RSSI Channel* and *RSSI ADC* on systems with OSD, and using the ExpressLRS *RC Link Preset* that matches the selected packet rate.



Ports tab – Serial Rx enabled on UART2



Receiver tab – Serial (via UART) and CRSF

The CRSF protocol requires a full, non-inverted UART in full-duplex mode. In the *CLI* tab, *serialrx_inverted = off* and *serialrx_halfduplex = off* must therefore be set; after a change, enter *save*.

5. Binding and operation

5.1 Firmware compatibility

The transmitter (module) and the receiver will only establish a link if their ExpressLRS firmware has the **same first number of the version** (major version). If the major versions differ, none of the binding methods will work. The update procedure is described in chapter 6.2.

5.2 Binding by power cycling

① Switch off the radio.

② Switch the receiver on and off three times in a row (by powering the drone or via the flight controller's USB); always switch it off within 1 second of switching it on.

③ After the third power-up, leave the receiver on. The green LED flashes twice, pauses and repeats – the receiver is in binding mode.

④ Switch on the radio and put the transmitter module into binding mode (e.g. the *[Bind]* item in the ExpressLRS Lua script).

⑤ As soon as the receiver LED lights up solid, binding is complete.

Binding mode is cancelled by restarting the receiver or by binding it to a transmitter. With newer firmware versions and a flight controller running Betaflight, the receiver can also be put into binding mode with the *Bind Receiver* button on the *Receiver* tab (CLI command *bind_rx*).

5.3 Binding with a Binding Phrase

Instead of binding, the same **Binding Phrase** can be entered into both the transmitter and the receiver – when flashing the firmware in *ExpressLRS Configurator* or in the receiver's web interface (chapter 6.1). Devices with the same phrase then connect automatically. The ExpressLRS documentation recommends a unique phrase of at least 8 alphanumeric characters. The phrase is not used for security but to prevent collisions with other devices.

❉ A receiver with older firmware that has a Binding Phrase set cannot be put into binding mode using the procedure in chapter 5.2.

5.4 LED indication

Green LED	Meaning
solid	connected to the transmitter (bound)
double flash, pause	binding mode
slow flashing	no signal from the transmitter module
fast flashing	WiFi mode
triple flash, pause[1]	connected, but Model Match setting does not match
medium-speed flashing[1]	radio chip not detected

[1] States according to the ExpressLRS documentation; the manufacturer does not list them.

5.5 Pre-flight check and failsafe

- Before the first flight, check **with the propellers removed** on the *Receiver* tab that all channels respond to stick and switch movements in the correct direction.
- Set up failsafe on the *Failsafe* tab and test it: after Arm (motors on) without propellers, switch off the radio – the motors must stop and the drone must enter failsafe.
- Assign Arm and Disarm (motors off) to a dedicated two-position switch.
- Check the link range and the correct orientation of the antennas; for the first test, the ExpressLRS documentation recommends placing the radio about 1 m from the receiver with the transmitter and receiver antennas oriented the same way.

6. Firmware, WiFi and further guides

6.1 WiFi mode and web interface

① Switch off the radio and switch on the receiver.

② If the receiver receives no signal from the transmitter, by default it switches to WiFi mode after about 60 seconds – the LED flashes fast.

③ On a computer or phone, connect to the **ExpressLRS RX** network, password **expresslrs**.

④ In a browser, open **http://10.0.0.1**.

In the web interface you can upload new firmware, change the Binding Phrase, the automatic WiFi start interval and other parameters. The receiver's WiFi antenna is small – keep the device you are connecting from close to the receiver.

6.2 Firmware update

Firmware is prepared in *ExpressLRS Configurator*. Select the category **BETAFPV 2.4 GHz** and the device **BETAFPV 2.4GHz Nano RX** (target BETAFPV_Nano_2400_RX). You can flash the firmware:

- **via WiFi** – method *WiFi*, *Build* button, upload the resulting file on the *Update* tab of the web interface (chapter 6.1),
- **via the flight controller** – method *BetaflightPassthrough*: connect the flight controller to the computer with a USB cable, keep Betaflight Configurator closed and press *Flash*.

※ The major firmware version of the receiver and the transmitter must match (chapter 5.1). Always update the firmware on both devices at the same time.

6.3 Telemetry power

On receivers with a power amplifier, the telemetry power can be set in the ExpressLRS Lua script on the radio: folder *Other Devices* → receiver → *Tlm Power*. The *MatchTX* option sets the telemetry power according to the transmitter power. Observe the limits given in chapter 3.2.

6.4 Further guides

Official ExpressLRS documentation – installation, binding, configuration and firmware updates:

www.expresslrs.org

7. Maintenance and troubleshooting

7.1 Maintenance

- After every flight, especially after a crash, check the antenna, the antenna cable, the solder joints and the mounting of the receiver.
- After flying in wet conditions or mud, disconnect the battery, clean the drone and let it dry (chapter 1.3).
- Do not continue to use a damaged antenna or a receiver with damaged potting compound.
- Store in a dry place, away from direct sunlight and heat sources.

7.2 Troubleshooting

Problem	Possible cause and solution
LED off	The receiver has no power. Check the 5V and GND pads and the 5 V output of the flight controller.
LED solid, but the model does not respond	The receiver is on a UART with an inverter or pull-down resistor, or the TX and RX wires are swapped. Check the wiring (4.1) and the Betaflight configuration (4.3).
LED flashes slowly	No signal from the transmitter: the radio is off, the receiver is not bound, or the major firmware versions differ (5.1). Bind again (5.2).
Cannot enter binding mode	The receiver has a Binding Phrase set (5.3), or it was not switched off within 1 s.
LED triple flash	Model Match does not match. In the Lua script, switch Model Match off and on again, or switch it off.
Channels do not respond in Betaflight	Serial Rx is not enabled on the correct UART on the Ports tab, or CRSF is not selected.
Short range, dropouts	The antenna is damaged or shielded by carbon or the battery, or it is too close to the VTX. Adjust the placement (4.2).

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 (DarwinFPV Cement ELRS 2.4G) is given on the label of the product packaging.

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.