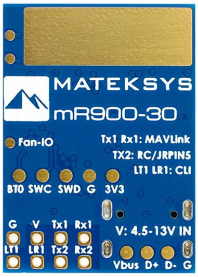
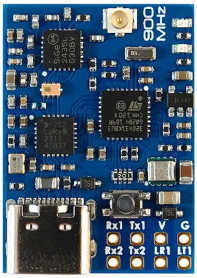
Matek mR900-30

mLRS receiver 868 MHz
User Manual





Read the entire manual before installation. The frequency band and transmit power must comply with the regulations of the country of operation.

Rotorama, s.r.o. · www.rotorama.com

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1. Safety instructions

1.1 Before you start

The Matek mR900-30 receiver is a radio device designed to be built into model aircraft, drones and other unmanned vehicles. It runs the open-source **mLRS** firmware (MAVLink Long Range System), which carries both the control channels (RC) and bidirectional MAVLink telemetry over a single radio link.

- Before installation, read this entire manual as well as the manuals for the mLRS transmitter module, the flight controller (FC) and the radio transmitter.
- This product is not a toy. It is not intended for children or for persons who are not familiar with operating RC models.
- The receiver is a bare printed circuit board without a housing. Installation and connection should be carried out by a user experienced in soldering and wiring model electronics.

1.2 Electrical safety and heat

- The supply voltage on the **V** pad must be within **4.5–13 V DC**. Higher voltage or reverse polarity will destroy the receiver.
- Protect the board against short circuits: conductive dust (carbon frames, metal filings), moisture and contact with metal parts of the model. Insulate the receiver, for example with heat-shrink tubing with openings for the LEDs and the button.
- The board heats up at higher transmit power. At a power of **500 mW and higher**, the manufacturer recommends attaching the supplied heatsink to the bottom side of the board (chapter 4.3).
- Disconnect the power before soldering. Solder quickly so as not to damage the pads and surrounding components.

1.3 Radio transmission

- **Never power on the receiver without an antenna connected.** Transmitting without an antenna may damage the output stage, especially at high power.
- Set the frequency band and transmit power so that they comply with the regulations of the country in which you operate the model (chapter 3).
- Do not hold the antenna in the immediate vicinity of your body while transmitting at high power.
- Before the first flight and after every change of settings, test the link and the failsafe behaviour (loss of signal) on the ground with the propellers removed.

2. Product description

2.1 Package contents

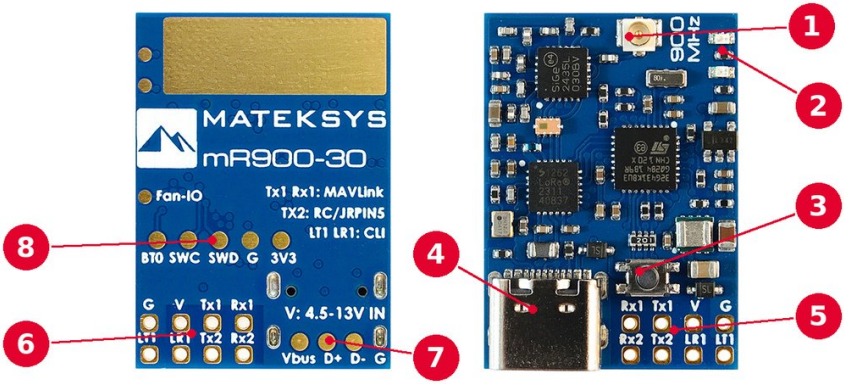


Receiver with the heatsink fitted and the dipole antenna

Item	Qty
Matek mR900-30 mLRS receiver	1×
Dipole antenna with IPEX MHF-1 connector, 8 cm cable	1×
Heatsink 20 × 20 × 6 mm	1×

Not included in the package: mLRS transmitter module or radio transmitter, connection cables to the flight controller, M3 screws for mounting the heatsink, or a USB-C cable.

2.2 Parts description



Bottom side (left) and top side (right) of the receiver

① IPEX MHF-1 antenna connector

② Status LEDs (red and green)

③ Button – bind mode and DFU mode (firmware update)

④ USB-C connector – firmware update

⑤ Solder pads Rx1, Tx1, V, G and Rx2, Tx2, LR1, LT1 (top side)

⑥ The same solder pads on the bottom side, labelled: G, V, Tx1, Rx1 / LT1, LR1, Tx2, Rx2

⑦ USB pads (Vbus, D+, D−, G)

⑧ Service pads (BT0, SWC, SWD, G, 3V3) – not connected in normal use

▶ Solder pad functions

Pad	Function
V / G	Power supply 4.5–13 V DC / ground (GND)
Tx1 / Rx1	Bidirectional MAVLink serial port (telemetry, optionally RC channels via MAVLink)
Tx2	RC channel output – CRSF or SBUS
LT1 / LR1	CLI serial port

2.3 Specifications

Parameter	Value
Processor	STM32G431KB
Radio chip	LoRa SX1262 with TCXO
PA/LNA amplifier	SE2435L
Firmware	mLRS, receiver target **rx-matek-mr900-30-g431kb**
Frequency band	900 MHz – 868 MHz (EU) or 915 MHz (FCC)
Transmit power (adjustable)	17 / 20 / 24 / 27 / 30 dBm
Maximum transmit power	30 dBm (1000 mW)
Operating modes (868/915 MHz)	31 Hz, 19 Hz, FSK (50 Hz)
Receiver sensitivity	−108 dBm (31 Hz), −112 dBm (19 Hz)
Antenna connector	IPEX MHF-1
Interfaces	TX1/RX1 MAVLink serial port, TX2 RC output (CRSF or SBUS), LT1/LR1 CLI, USB-C
Power supply	4.5–13 V DC on the V pad
Current consumption	340 mA average, 850 mA peak at 5 V (31 Hz, 30 dBm)
Board dimensions	29 × 21 mm
Weight	5.3 g with antenna

▶ Serial link data rate

Mode	Downlink	Uplink
31 Hz	2562 B/s	2000 B/s
19 Hz	1547 B/s	1207 B/s
FSK (50 Hz)	4100 B/s	3200 B/s

※ The manufacturer does not specify FSK mode for long-range flights.

2.4 Compatibility

- The receiver will only link with a transmitter module running **mLRS** firmware in the same band (868/915 MHz) and with the same common parameters (Bind Phrase, Mode, RF Band).
- Matek mLRS 900 MHz receivers and modules with SX126x and STM32WLE5 chips are mutually compatible (e.g. mR900-30, mR900-22).
- **The receiver is not compatible** with ExpressLRS 900 MHz or FrSky R9 hardware, which use SX127x chips. They will not pair.
- Receiver firmware starts with *rx-*, transmitter module firmware with *tx-*. Two modules with the same firmware type will not link.

2.5 Status LEDs

Indication	Meaning
Red blinks at 2 Hz	Receiver is not linked with the transmitter module
Green blinks at 1 Hz	Receiver is linked with the transmitter module
Red and green blink alternately (approx. 2.5 Hz)	Bind mode (pairing)
LEDs do not blink after connecting USB with the button pressed	DFU mode (firmware update)
No LED is lit or blinking	Check the power supply and the wiring of the V and G pads

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

3.1 The law of the country in which you operate the device is decisive

European regulations for radio equipment and unmanned aircraft apply in all member states of the European Union, but national implementing regulations differ from country to country – permitted frequency bands, maximum transmit power, operator registration, geographical zones and mandatory insurance. The information in this chapter describes the situation in the Czech Republic. If you operate the device in another country, you must follow the regulations of the country in which you operate it.

3.2 Frequencies and transmit power

In the Czech Republic, the operation of short-range devices in the 868 MHz band is governed by the general authorisation of the Czech Telecommunication Office (ČTÚ) No. VO-R/10. For non-specific short-range devices it sets the following limits:

Frequency band	Max. power	Duty cycle*
863–870 MHz	25 mW e.r.p.	0.1 % or 1 %
868.0–868.6 MHz	25 mW e.r.p.	1 %
868.7–869.2 MHz	25 mW e.r.p.	0.1 %
869.4–869.65 MHz	500 mW e.r.p.	10 %
869.7–870 MHz	5 mW e.r.p.	no limit

* The duty cycle limit does not apply to devices that use spectrum access and interference mitigation techniques in accordance with harmonised standards. Detailed conditions can be found in the current version of the authorisation at www.ctu.cz.

- The receiver's adjustable power levels (17–30 dBm, i.e. 50–1000 mW) are **higher than the 25 mW e.r.p. limit** applicable to most of the 863–870 MHz band; the highest levels also exceed the 500 mW e.r.p. limit.
- The **915 MHz (FCC)** band is intended for markets outside the EU. Do not use it in the Czech Republic or the European Union – leave the *RF Band* parameter set to **868**.
- Under the general authorisation, only the antenna specified by the manufacturer may be used, and the device must not be modified or supplemented with additional amplifiers.
- The operator is responsible for setting the band and power in accordance with the regulations of the country of operation.

3.3 Operation in a model or drone

The receiver is a component. The operator of the model or drone in which the receiver is installed is responsible for its operation. In the European Union, the operation of unmanned aircraft is governed by Regulation (EU) 2019/947 – in particular operator registration, pilot competency, operational categories and flight restrictions. In the Czech Republic, information is provided by the Civil Aviation Authority (ÚCL) (www.caa.gov.cz).

4. Installation

4.1 What else you need

- a transmitter module with mLRS firmware for the 868/915 MHz band (e.g. Matek mR900-30-TX) and a radio transmitter that communicates with it via the CRSF protocol,
- a flight controller (FC) with ArduPilot or INAV firmware and a free serial port (UART) – plus another free UART for RC channel output via CRSF or SBUS,
- a 5 V supply from the flight controller (or another 4.5–13 V source), wires and a soldering iron,
- a computer and a USB-C cable for firmware updates.

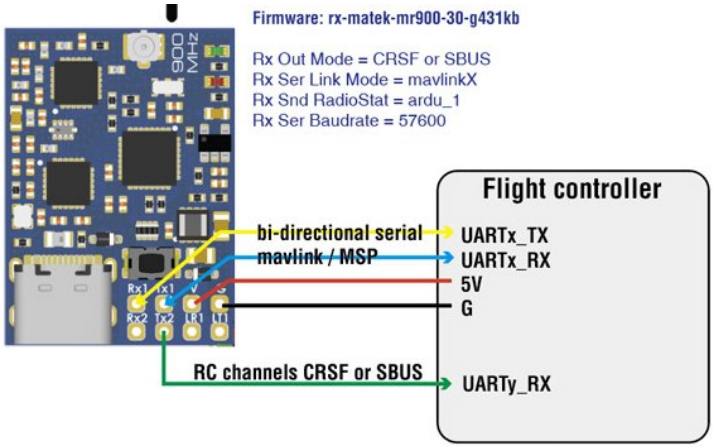
4.2 Positioning the receiver and antenna

- Connect the antenna to the IPEX MHF-1 connector **before powering on for the first time**. Press the connector on straight without levering; it is mechanically fragile.
- Place the antenna as far as possible from carbon parts, metal parts, wires and the pilot's body. If the model allows, orient it vertically – the same as the antenna of the transmitter module.
- Do not bend the antenna's coaxial cable at sharp angles and secure it against being pulled out of the connector.
- Mount the receiver so that it is not subjected to vibration and the LEDs and button remain accessible.

4.3 Heatsink

When the transmit power is set to **500 mW and higher**, the manufacturer recommends attaching the supplied 20 × 20 × 6 mm heatsink to the bottom side of the board. The gaps between the heatsink fins can be used to mount the receiver with M3 screws.

4.4 Connecting to the flight controller



Wiring the receiver to the flight controller (manufacturer's diagram)

① Receiver pad **Rx1** → **TX** pin of a flight controller serial port (UART).

② Receiver pad **Tx1** → **RX** pin of the same serial port.

③ Pad **V** → **5 V** output of the flight controller.

④ Pad **G** → ground (GND) of the flight controller.

⑤ If you want to transmit RC channels via the CRSF or SBUS protocol, connect pad **Tx2** to the **RX pin of another** serial port of the flight controller.

※ RC channels can also be transmitted over the MAVLink link (Tx1/Rx1) – in that case the wire from Tx2 is not needed (chapters 4.5 and 4.6).

4.5 Flight controller setup – ArduPilot

The default settings of the mLRS receiver (*Rx Out Mode* = crsf, *Rx Ser Baudrate* = 57600, *Rx Ser Link Mode* = mavlinkX, *Rx Snd RadioStat* = ardu_1) correspond to the recommended wiring with ArduPilot, so they usually do not need to be changed. In the ground station, set:

▶ MAVLink serial port (SERIALx = UART connected to Tx1/Rx1)

Parameter	Value
SERIALx_PROTOCOL	2 (MAVLink2)
SERIALx_BAUD	57 (57600 – same as *Rx Ser Baudrate*)
SERIALx_OPTIONS	4096 (ignore ground station commands that change stream rates)

▶ RC channels via CRSF (SERIALy = UART connected to Tx2)

Parameter	Value
SERIALy_PROTOCOL	23 (RCIN)
SERIALy_OPTIONS	0
RC_PROTOCOLS	536 or 512
RSSI_TYPE	3 or 5

- For the receiver to send telemetry to the radio transmitter, ArduPilot must stream MAVLink messages – set the stream parameters (MAVy, SRy in older versions). Some vehicles (e.g. Copter) do not have them enabled by default.
- If you do not use the wire from Tx2, set *Rx Snd RcChannel* in the receiver to **rc channels** (for newer ArduPilot versions with MAVLink RC support), otherwise to **rc override**.
- A UART with DMA is recommended for CRSF. Details can be found in the ArduPilot and mLRS documentation.

4.6 Flight controller setup – INAV

With INAV, the **MspX** mode is recommended; it carries RC channels, telemetry and link statistics over a single serial port.

① In the receiver, set *Rx Ser Link Mode* = **mspX**, *Rx Ser Baudrate* = **115200** and *Rx Snd RcChannel* = **rc override** or **rc channels**.

② In INAV Configurator, on the *Ports* tab, enable the **MSP** protocol for the receiver UART (do not enable *Serial RX*) and set the speed to 115200.

③ On the *Receiver* tab, select *Receiver Mode* = **MSP** and *RSSI Source* = **MSP** and save.

④ Move the sticks of the radio transmitter to verify that the channel values change.

※ The current version of INAV is recommended.

5. Getting started

5.1 Pairing (bind)

The transmitter module and the receiver link when their common parameters (Bind Phrase, Mode, RF Band) match. After the first firmware upload or after a factory reset, both devices have the same default values and usually link immediately. Otherwise, pair them:

① Power on the receiver and **hold the button for approx. 4 s**. Alternatively, power the receiver on and off three times in quick succession (wait until the LEDs blink three times) – on the fourth power-on it enters bind mode.

② The LEDs start blinking alternately red and green (approx. 2.5 Hz).

③ Switch the transmitter module to bind mode – with its button (approx. 4 s), with the *bind;* command in the CLI, in the mLRS Lua script or on the OLED display, if available. The order of the receiver and module does not matter.

④ Once linked, the green LED on the receiver blinks (1 Hz).

5.2 Parameter settings

Receiver parameters are set **via the transmitter module** while the receiver is linked: with the mLRS Lua script in the radio transmitter (*SYS → TOOLS → mLRS Configurator*), in the CLI or on the module's OLED display. Install the Lua script using the mLRS Web Flasher web application.

Changes are stored permanently only after selecting Save in the Lua script or with the pstore; command in the CLI. Many parameters take effect only after the next power-on.

Parameter	Meaning
Bind Phrase	Common link password – 6 characters (a–z, 0–9, _ # - .)
Mode	Operating mode: 31 Hz, 19 Hz, FSK
RF Band	Frequency band: 868 or 915 FCC
Rx Power	Receiver transmit power (telemetry)
Rx Out Mode	Tx2 output protocol: sbus, crsf, sbus inv
Rx FailSafe Mode	Behaviour on loss of signal (chapter 5.3)
Rx Ser Baudrate	Tx1/Rx1 port speed: 57600, 115200, 230400
Rx Ser Link Mode	Serial port processing: transp., mavlink, mavlinkX, mspX
Rx Snd RadioStat	RADIO_STATUS messages and flow control: off, ardu_1 (ArduPilot), meth_b (PX4)
Rx Snd RcChannel	RC channels over MAVLink: off, rc override, rc channels
Rx Power Sw Ch	Channel for switching power with a switch on the radio transmitter

5.3 Failsafe

The *Rx FailSafe Mode* parameter determines what the receiver outputs on the RC channel output after loss of signal. The default option, strongly recommended by the firmware developer, is **no sig** – the receiver stops sending RC data and the flight controller triggers its own failsafe action (e.g. return to home).

Option	Behaviour
no sig	Receiver sends no RC data (recommended)
low thr	Throttle to minimum, other channels hold their last value
by cnf	Channels take the values set in *Rx FS Ch1* to *Rx FS Ch16*
low thr cnt	All channels centred, throttle to minimum
ch1ch4 cnt	Channels 1–4 centred

Also set up failsafe in the flight controller and test it on the ground with the propellers removed before a loss of link occurs in flight.

5.4 Ground test and range test

① Remove the propellers and power on the radio transmitter, the module and the model. Check the link using the LEDs.

② In the Lua script or in the CLI, set *Rx Power* and *Tx Power* to the lowest level.

③ Verify that the ground station downloads the parameters and displays telemetry (position, GPS, battery voltage), and that flight modes can be switched and Arm (motors on) and Disarm (motors off) performed from both the radio transmitter and the ground station.

④ Perform a walking range test – move away from the model with the radio transmitter and monitor the link quality.

⑤ Before flying, set the power back to an appropriate value in accordance with chapter 3.

5.5 Firmware update

The receiver is supplied with mLRS firmware preinstalled. An update is advisable if you need a fix or a new feature. Use the **same firmware version** on both the receiver and the transmitter module. Versions ending in an even number are stable; versions ending in an odd number are development versions.

▶ mLRS Web Flasher (recommended)

① In a Chromium-based browser, open olliw.eu/mLRSFlasher.

② Hold the receiver button and connect the USB-C cable. The receiver is in DFU mode (LEDs do not blink).

③ Select the target **rx-matek-mr900-30-g431kb** and follow the instructions of the application.

▶ STM32CubeProgrammer

① Install STM32CubeProgrammer and the DFU drivers. Download the firmware from github.com/olliw42/mLRS.

② Connect the receiver to the computer with the button pressed, select *USB*, *USB1*, *Refresh* and *Connect*.

③ In the *Erasing & Programming* section, select all sectors and click *Erase selected sectors*.

④ Select the firmware file (hex or bin) and click *Start Programming*.

⑤ Disconnect and reconnect USB. If the red LED blinks at 2 Hz, the receiver is waiting for a link with the transmitter module.

※ The firmware can also be uploaded via INAV or Betaflight Configurator by selecting a local file, just as with a flight controller. Parameters are usually retained during an update unless you erase the entire memory.

5.6 Use as a transmitter module

After uploading transmitter module firmware, the same hardware can be used on the radio transmitter side: target **tx-matek-mr900-30-g431kb-default** (TX module mode) or **tx-matek-mr900-30-g431kb-siktelem** (SiKTelem mode). The wiring for these modes is given by the manufacturer on the product page www.mateksys.com.

6. Operation

6.1 Pre-flight check

- The antenna is connected, undamaged and correctly oriented; the cable is secured.
- The receiver is firmly mounted, insulated and there is no risk of a short circuit anywhere.
- After power-on, the green LED blinks (linked) and the ground station or radio transmitter displays telemetry.
- Transmit power and band comply with the regulations of the country of operation.
- Failsafe is set up and tested.

6.2 In flight

- Monitor the link quality (RSSI, LQ) in the telemetry or in the OSD. If it drops, fly back closer.
- Keep in mind that the loss of the RC link and the loss of telemetry may not occur at the same distance – the ground station may report a loss of link earlier or later than the flight controller triggers failsafe.
- Metal and carbon parts, wires and body parts near the antenna reduce the range.

7. Maintenance and troubleshooting

7.1 Maintenance and storage

- Regularly check the antenna, coaxial cable and IPEX connector, the solder joints and the board insulation.
- Replace a damaged antenna with an antenna for the 868/915 MHz band with an IPEX MHF-1 connector.
- Clean the receiver with a dry brush; do not use water or solvents.
- Store in a dry place, away from direct sunlight and conductive objects.

7.2 Troubleshooting

Problem	Possible cause and solution
No LED is lit	No power – check the voltage and the wiring of the V and G pads.
Red LED keeps blinking at 2 Hz, no link is established	The devices are not paired (chapter 5.1); Bind Phrase, Mode or RF Band differ; the module has an incompatible SX127x chip (ELRS 900 MHz, FrSky R9); both modules have firmware of the same type (rx/rx or tx/tx).
Flight controller does not receive telemetry	Swapped wires – receiver Rx1 goes to the flight controller TX; port speed does not match; SERIALx_PROTOCOL is not 2; wrong *Rx Ser Link Mode* selected.
Flight controller does not see RC channels	Tx2 is not connected to the RX of another UART; *Rx Out Mode* does not match the protocol in the flight controller; with RC over MAVLink, *Rx Snd RcChannel* = off.
Short range	Damaged or poorly positioned antenna; antenna near carbon or metal; power too low.
Receiver overheats	At a power of 500 mW and higher, attach the heatsink (chapter 4.3).
Changed parameters revert after power-on	Changes were not saved – use Save in the Lua script or pstore; in the CLI.

▶ Further information

- mLRS project documentation: github.com/olliw42/mLRS-docu
- Manufacturer's product page: www.mateksys.com

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 (mR900-30) is printed on the circuit board; the firmware version is shown by the mLRS Lua script or by the *v;* command in the CLI of the transmitter module.

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.