ROTORAMA

MSTAR24

2.4GHz multipoint telemetry radio for drones
MSTAR24-BASE • MSTAR24-F • MSTAR24-F-Mini

The transmit power of the modules can be set to values that are not permitted in the EU. In the Czech Republic and the EU, the device may only be operated with a radiated power of up to 100 mW e.i.r.p. — read Chapter 3 before first use.

User Manual

Contents

1. Safety Instructions

1.1 Before You Start

Read this entire manual carefully before putting the device into operation and keep it for future reference. If you pass the product on to another person, include this manual with it.

- The MSTAR24 telemetry system is designed for the **wireless transmission of telemetry and other serial data** between unmanned vehicles and a ground station. Do not use it for any other purpose.
- The product is not a toy. Keep it out of the reach of children.
- Do not disassemble or modify the device. Unqualified intervention may damage the device, cause interference to other services and void your rights arising from defective performance.
- Do not use a device that is visibly damaged or behaves unusually (overheats, disconnects spontaneously).

1.2 Radio Operation

In the Czech Republic and the EU, the device may only be operated so that the total radiated power (e.i.r.p.) does not exceed 100 mW (20 dBm) — including antenna gain. Both module types allow a higher power to be set; such a setting is prohibited in the EU. See Chapter 3 for details.

- Never transmit without an antenna connected — the transmitter may be damaged.
- Do not connect RF amplifiers to the device; their use is prohibited in this band.
- The telemetry link is not a rescue or safety system. Loss of the link must not lead to a dangerous situation — the vehicle's flight controller (FC) must have a correctly configured failsafe.
- Keep the antennas at a safe distance from your body; the device is not intended for continuous operation in close proximity to people.

1.3 Power Supply and Installation

- The MSTAR24-BASE ground module is powered from the computer's **USB** port. Use an undamaged USB cable that supports data transfer.
- The MSTAR24-F air module is powered with **5 V** from the flight controller's serial connector. Check the wiring of the individual leads before connecting — reversed power can destroy the module.
- The serial interface of the modules uses **3.3 V** logic levels. Do not connect it to 5 V TTL levels.
- Mount the air module and its antenna on the vehicle so that they cannot come loose in flight or come into contact with the propellers.

1.4 Operating Environment

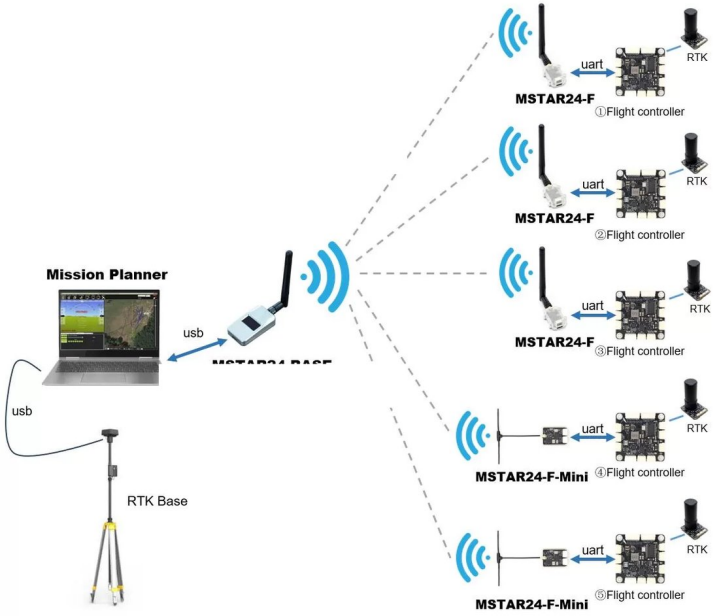
- Protect the device from water, snow and condensing moisture. The modules are not waterproof.
- Do not operate the device near sources of strong interference and do not expose it to extreme temperatures or direct sunlight behind glass.
- Clean the device with a dry, soft cloth. Do not use solvents.

2. Product Description

2.1 The MSTAR24 System

MicoAir MSTAR24 is a telemetry system operating in **one-to-many** (point-to-multipoint) mode. A single ground station with an **MSTAR24-BASE** module simultaneously monitors and controls up to **8 vehicles**, each carrying an **MSTAR24-F** or **MSTAR24-F-Mini** air module. The system transmits in the **2.4 GHz** band and uses **LoRa** spread-spectrum modulation, which is resistant to interference.

The transmission is transparent — it is typically used for the **MAVLink2** protocol between flight controllers running **ArduPilot** or **PX4** firmware and a ground station (Mission Planner, QGroundControl), but any other serial data will pass through the link as well.



The MSTAR24 system: the BASE ground module and air modules on the individual vehicles

2.2 Package Contents

Package	Contents
MSTAR24-BASE	1× MSTAR24-BASE ground module 1× 2.4 GHz antenna
MSTAR24-F (2 pcs)	2× MSTAR24-F air module 2× 2.4 GHz antenna

The ground and air modules are sold separately. A working setup requires one MSTAR24-BASE module and one air module for each vehicle. A USB cable is not included.

2.3 MSTAR24-BASE Ground Module

The ground module connects to the computer via **USB**. After the driver is installed, it does not appear in the system as a single serial port, but as **eight separate ports ChA to ChH** — each corresponding to one air module. The antenna connects to an **SMA** connector.

The front panel features an **OLED display** showing the module name, the selected rate mode and the signal strength of the individual channels as a percentage.

The ground module display: channel signal strength and the ChA–ChH channel assignment

2.4 MSTAR24-F and MSTAR24-F-Mini Air Modules

The **MSTAR24-F** air module has a **JST-GH1.25 4P** connector (GND, 5V, RX, TX) for connection to the flight controller's serial port, from which it is also powered with **5 V**. A **USB** interface with a built-in **CP2102** converter is used for configuration from a computer. The antenna connects to an **SMA** connector. The link status is indicated by a **green LED** — it lights continuously when the link is established.

The smaller **MSTAR24-F-Mini** variant connects to the flight controller in the same way; it is configured via its serial port using a USB-TTL adapter with 3.3 V logic levels.

※ The MSTAR24 firmware is not compatible with the MicoAir LR24, LR868 and LR900 series telemetry radios — the modules will not connect to each other. Do not use the setup procedures intended for those series either.

In addition to one-to-many (Network) mode, the air modules also support conventional one-to-one bidirectional transmission (Duplex) and one-way transmission or reception (Broadcast). This manual describes the one-to-many mode.

2.5 Technical Specifications

※ In the Czech Republic and the EU, operation is only permitted up to 100 mW (20 dBm) e.i.r.p. — see Chapter 3.2.

Parameter	MSTAR24-BASE	MSTAR24-F
Frequency band	2400–2482 MHz (channels 0–82)	
Modulation	LoRa	
Max. transmit power ※	1000 mW (30 dBm)	500 mW (adjustable 500/200/100/50/10 mW)
Number of air modules	1–8 (default 4)	slave ID 0–7
Throughput (total downlink)	10.5 KB/s standard mode 22 KB/s high-speed mode	2.4 / 4 / 8 / 20 KB/s by rate mode
Module address	1–30000 (default 8888)	
Interface	USB (8 virtual ports ChA–ChH)	UART JST-GH1.25 4P, USB (CP2102)
Default baud rate	57600	57600 (GH port 9600–1000000)
Power supply	USB	5 V
Antenna connector	SMA	SMA
Weight	29.5 g	8 g
Dimensions	61 × 31 × 12.7 mm	43.4 × 25.8 × 11 mm
Range	up to 10 km (manufacturer's figure; depends on power, antennas and environment)	

3. Legal Conditions for Operating the Radio Equipment

3.1 The Law of the Country of Operation Applies

Requirements for radio equipment are harmonised by Directive 2014/53/EU (RED), which applies in all Member States of the European Union. However, the specific conditions for spectrum use — permitted bands, maximum radiated power and the authorisation regime — are set by national regulations and differ from country to country. The information in this chapter describes the situation in the **Czech Republic**. If you operate the device in another country, you must comply with the regulations of the country in which you use it.

3.2 Frequencies and Transmit Power in the Czech Republic and the EU

The device operates in the **2400–2482 MHz** band. In the Czech Republic, operation falls under the CTU general authorisation **VO-R/12** for wideband data transmission in the 2.4 GHz band — no individual licence is required, provided the following conditions are met:

- The maximum radiated power is **100 mW (20 dBm) e.i.r.p.**. This limit includes **antenna gain** — with a higher-gain antenna, the set transmitter power must be reduced accordingly.
- The use of **external amplifiers** is prohibited.
- Maximum radio-frequency power transmitted by the device in this band for operation in the EU: **20 dBm (100 mW) e.i.r.p.**

The ground module allows a power of up to 1000 mW to be set and the air modules up to 500 mW. In the Czech Republic and the EU, set the transmit power of all modules so that the e.i.r.p. does not exceed 100 mW. Operation at higher power is not covered by the general authorisation and constitutes an offence under Czech Act No. 127/2005 Coll., on electronic communications.

3.3 Shared Band and Interference

- The 2.4 GHz band is shared with other devices (Wi-Fi, Bluetooth, RC systems and others). Operation is **without protection from interference** — no protection can be claimed against interference from other authorised devices.
- The device must not cause harmful interference to other services and authorised operations. If it does cause interference, the user must immediately stop or adjust the operation.
- When operating several MSTAR24 sets at one location, choose a different module address for each set and, if possible, a different communication channel.

4. Setting Up the Ground Module

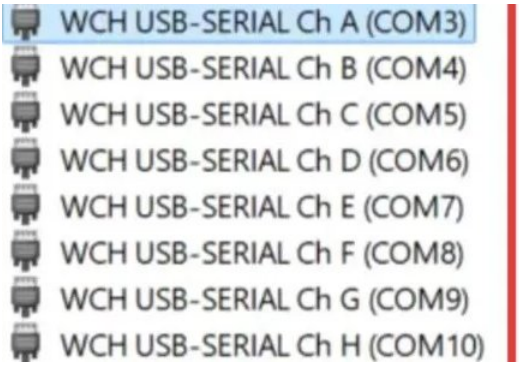
4.1 Driver Installation and Connecting to the Computer

① Download the Windows driver from micoair.com/download/4238 and extract it.

② Run the installer, select *USB to Multi-Serial Port* and click *Install Driver*. The installation completes automatically.

③ Connect the MSTAR24-BASE module to the computer with a USB cable (it must support data transfer).

④ Open Windows Device Manager. Under *Ports (COM & LPT)*, **eight serial ports ChA to ChH** will appear. The COM port numbers are assigned automatically by the system and vary between computers.



Device Manager: the eight ChA–ChH ports of the ground module

Port **ChA** corresponds to the air module with slave ID 0 and is also used for **configuring the ground module**. ChB corresponds to slave ID 1, ChC to slave ID 2, and so on up to ChH (slave ID 7).

※ If the computer shows only one port, or the ChA–ChH ports are missing, check the driver installation, the USB data cable and Device Manager (a yellow exclamation mark = a faulty driver).

4.2 Configuring the Ground Module in MicoAssistant

The parameters are configured in the **MicoAssistant** application (version 0.9.16 or later), available at micoair.com/download/3535. In the application, select the COM port corresponding to **ChA**, set the baud rate to **57600** and click *Connect*. Then open the telemetry settings page using the icon on the right — the application recognises the module automatically. The *Read Settings* button loads the stored parameters; *Write Settings* writes new ones.

Parameter	Description	Recommendation
Rate Mode	Standard mode: total throughput 10.5 KB/s. High-speed mode: 22 KB/s.	Use high-speed mode with more vehicles or larger data volumes
Number of Slave Units	Number of air modules, 1–8 (default 4). The more modules, the less bandwidth each one receives.	Set the actual number of connected vehicles
Transmit Power	Transmit power of the ground module (up to 1000 mW).	In CZ/EU max. 100 mW e.i.r.p. — see Ch. 3.2
Frequency Mode	Fixed to manual mode.	Keep the default
Module Address	Only modules with the same address will connect. Range 1–30000 (default 8888).	Same across the set; different for each set when using several sets
Communication Frequency	Operating channel 0–82 (2400–2482 MHz), default 0.	Same across the set; different for each set when using several sets

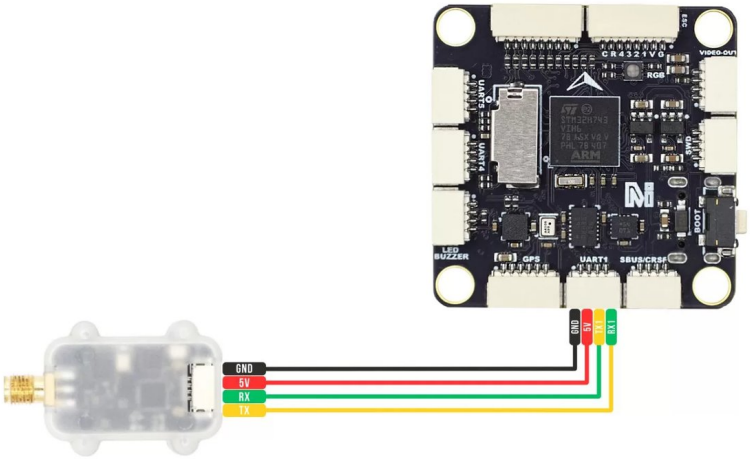
The available bandwidth is shared between all configured air modules. Example: with 4 modules and standard mode, each vehicle receives roughly 10.5 / 4 ≈ 2.6 KB/s. If you configure more modules than are actually flying, the bandwidth is needlessly split among unused channels as well and the ground station responds slowly.

5. Setting Up the Air Modules

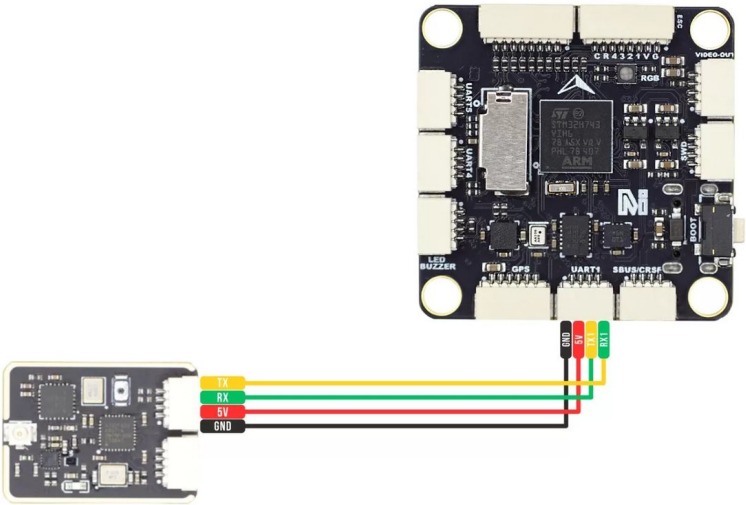
5.1 Wiring to the Flight Controller

Connect the air module to a serial port on the flight controller (FC), typically **TELEM1 (Serial1)**. The data signal wires are crossed:

- Telemetry TX → flight controller RX
- Telemetry RX → flight controller TX
- GND → GND, 5V → 5 V power output



Wiring the MSTAR24-F module to the flight controller



Wiring the MSTAR24-F-Mini module to the flight controller

5.2 Configuring the Air Module

The MSTAR24-F module has a built-in **CP2102** USB converter — install its driver before connecting for the first time (micoair.com/download/3391). Connect the module to the computer, find the CP2102 converter's COM port in Device Manager, select it in MicoAssistant, set the baud rate to **57600** and click *Connect*. Open the telemetry settings page using the icon on the right; *Read Settings* loads the parameters, *Write Settings* writes them.

Parameter	Description	Recommendation
Operating Mode	For one-to-many operation, networking mode (Network) must be selected — the default setting.	Keep Network
Slave Unit ID	Distinguishes the individual air modules. Range 0–7, default 0.	A different ID for each module, consecutively from 0
Transmit Power	Transmit power of the module (up to 500 mW).	In CZ/EU max. 100 mW e.i.r.p. — see Ch. 3.2
Rate Mode	The module's high-speed mode corresponds to the ground module's standard mode; ultra-high-speed corresponds to high-speed.	Match the ground module's mode
Module Address	Range 1–30000, default 8888.	Same as the ground module
Frequency Mode	Must be set to manual mode for the air module (default).	Keep the default
Communication Frequency	Channel 0–82 (2400–2482 MHz), default 0.	Same as the ground module
Serial Baud Rate	Baud rate of the GH1.25 connector, default 57600.	Must match the flight controller port
USB Baud Rate	Baud rate of the USB interface, default 57600.	Keep the default

5.3 Mapping Air Modules to Channels

The slave ID of the air module determines on which serial port of the ground module the vehicle appears:

Air module slave ID	Ground module port	Example
0	ChA	vehicle 1
1	ChB	vehicle 2
2	ChC	vehicle 3
3	ChD	vehicle 4
4	ChE	vehicle 5
5	ChF	vehicle 6
6	ChG	vehicle 7
7	ChH	vehicle 8

6. Connecting Multiple Vehicles

Each flight controller in the setup must have its **own system ID** — otherwise the ground station cannot tell the vehicles apart.

6.1 ArduPilot Flight Controller Setup

Connect the flight controller to the computer via USB and open Mission Planner. If the air module is connected to the TELEM1 (Serial1) port, set:

- **SERIAL1_BAUD = 57600**
- **SERIAL1_PROTOCOL = MAVLink2**
- If wired to a different serial port, set the corresponding **SERIALx_BAUD** and **SERIALx_PROTOCOL** parameters.

Then connect each flight controller individually and set **SYSID_THISMAV**: first vehicle 1, second vehicle 2, third vehicle 3, and so on.

6.2 PX4 Flight Controller Setup

Connect the flight controller to the computer via USB and open QGroundControl. If the air module is connected to TELEM1, set the following in the *MAVLink* parameter group:

- **MAV_0_CONFIG = TELEM1**
- **MAV_0_FORWARD = Disabled**
- **MAV_0_MODE = Normal**
- **MAV_0_RATE = 1200 B/s**

After saving the parameters, restart the flight controller, reconnect it and set **SER_TEL_1_BAUD = 57600 8N1** in the serial port settings. Finally, give each flight controller a unique **MAV_SYS_ID** (first vehicle 1, second 2, third 3…).

6.3 Pre-Connection Checklist

- The ground module is connected to the computer via USB.
- Each air module is connected to its flight controller and powered.
- Each air module has a different slave ID.
- Each flight controller has a different MAVLink system ID.
- The module address and communication channel are the same on the ground module and all air modules.
- The rate modes of the ground module and the air modules correspond to each other.
- When the link is established correctly, the air module's green LED lights continuously and the ground module's display shows the signal strength of the corresponding channel.

6.4 Mission Planner

① In the upper-right corner, select the COM port corresponding to **ChA**, set the baud rate to **57600** and click *Connect* — vehicle 1 connects (the air module with slave ID 0).

② Right-click the black area of the top toolbar and select the connection option.

③ In the connection window, select the COM port corresponding to **ChB**, baud rate 57600, and connect vehicle 2.

④ Connect additional vehicles in the same way, in the order ChC, ChD, etc.

If the vehicles are outdoors and have a valid GPS position, you will see them all at the same time on the Mission Planner map.

6.5 QGroundControl

① Open the communication links page (*Comm Links*) and click *Add*.

② Name the first profile “Vehicle 1”, select the COM port corresponding to **ChA**, set the baud rate to **57600** and save.

③ Create the “Vehicle 2” (ChB), “Vehicle 3” (ChC) and further profiles in the same way.

④ Select the required profiles and click *Connect* — QGroundControl connects to all the vehicles at once. Reading the parameters may take 1–2 minutes.

The multi-vehicle view can be selected in the upper-right corner to monitor the status of all connected vehicles side by side; you can also switch between vehicles from the toolbar and configure parameters or plan missions for each one individually.

7. Troubleshooting

Problem	Possible cause and solution
The computer does not show the ChA–ChH ports	Check the driver installation, use a USB data cable, make sure the MSTAR24 ground module is connected, and look for yellow exclamation marks in Device Manager.
Yellow exclamation mark in Device Manager	The driver is missing or damaged — remove the device, install the correct driver and reconnect the module.
MicoAssistant does not recognise the module	Check the selected COM port and 57600 baud rate, that *Radio Config* is enabled, the TX/RX crossover, common ground and power supply. Close other programs using the port.
Only one vehicle connects / the station mixes up vehicles	Check that each air module has a different slave ID, each flight controller has a different system ID, and that the flight controller port baud rate matches the telemetry baud rate.
The air module does not connect (LED not lit continuously)	Check that the module address and communication channel match and that the rate modes of the ground and air modules correspond.
Slow response, long parameter loading	The bandwidth is shared between all configured modules. Set the number of air modules to the actual number of vehicles, choose a higher rate mode, or reduce the MAVLink data rate from the flight controller.
Saved parameters do not take effect	After writing, confirm the save was successful, restart the module and read the parameters again. Check that the address, channel and mode match across the whole set.
The port cannot be opened (busy)	A COM port can only be used by one application at a time — close Mission Planner, QGroundControl or a terminal, then try again.

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.cz

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 (MSTAR24-BASE, MSTAR24-F, MSTAR24-F-Mini) and the serial number are given on the product or its packaging; the firmware version is shown by the MicoAssistant application when the module is connected.

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.