# DroneBeacon - Transponder Manual 120-series
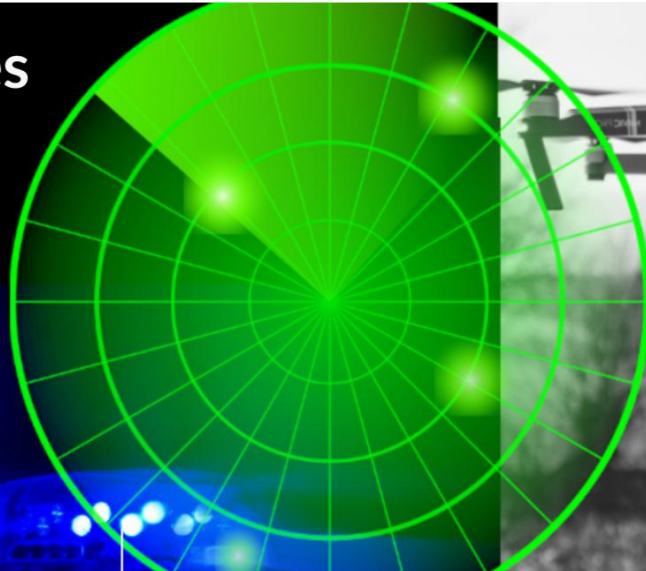
*November 2023 - version 1.2*



Remote ID for drones

The latest version of this manual is located here:
https://download.bluemark.io/db120.pdf

**Intended audience**: users of the db120 transponder

**Disclaimer:** we are not responsible or liable for errors or incomplete information in this document.

*Version history*

| version | date | description | |
|---------|------|-------------|---|
| 1.0 | December 2022 | ● | Initial release |
| 1.1 | April 2023 | ● | Updated documentation to be in line with newest firmware |
| | | ● | Improved quick start |
| 1.2 | November 2023 | ● | Added EU information |

# QUICK START

## Attach to the drone

For optimal performance attach the db120 on the top of your drone/airframe:
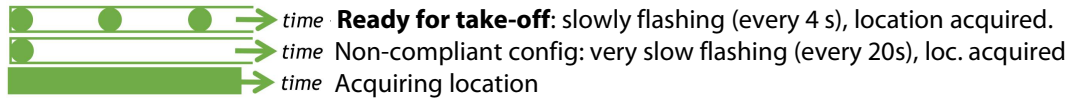- Use the 3M dual lock™ stickers (included).
  *clean the surface and remove the foil of the 3M dual lock sticker, apply firm pressure and wait 1 hour for optimal adhesion. Snap the db120 to the counter part sticker on the drone.*
- Or/and use two M5 screws.
  *the db120 has two M5 screw noses that can be used for attaching the db120 to your drone.*

## Use the db120

- Move the on-off power switch to *on* to power up the transponder.
- Wait for a GPS fix (slowly flashing battery LEDs every 4 seconds). The battery LED indicates the battery level in steps of 25%.
- You are ready to fly. After your flight, turn the db120 off using the on-off power switch.

## Status LEDs

- *time* **Ready for take-off**: slowly flashing (every 4 s), location acquired.
- *time* Non-compliant config: very slow flashing (every 20s), loc. acquired
- *time* Acquiring location

## Charge

Charge the db120 using a USB-C charger.
- the charge LED will be red during charging and turns to green if it has been fully charged.
- the db120 can be charged with USB-C charger that provides 5V.

## Configuration

For typical use in the USA no configuration is required. USA: use the db120 S/N number for registering your drone at the FAA. For the EU, you need to enter your operator ID and UA class.
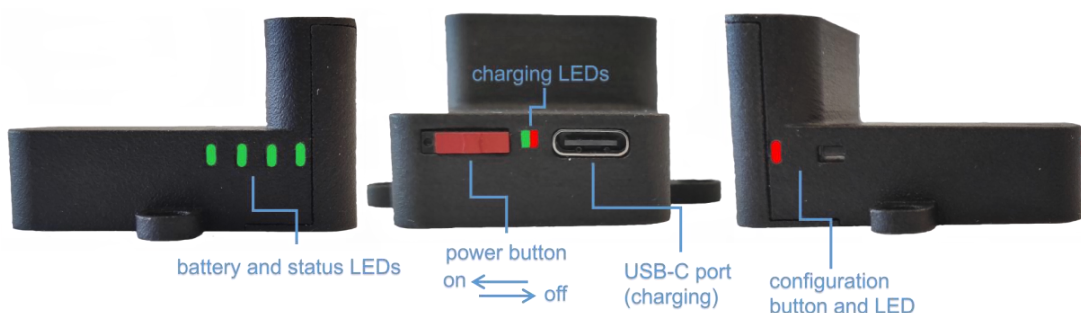- After the db120 is powered, press the configuration button. The *red* config LED is now solid red.
- Connect to the *dronebeacon* WLAN network (no password needed)
- Point your browser to http://192.168.50.1 or scan the QR code.

⚠️ *Flying a drone could create risks for people, air traffic and other assets. Before flying, the drone operator has to make sure to know the local rules regarding drone flights and obtain the necessary authorization to fly the drone(s).*

*configuration web-page*



battery and status LEDs

power button
on ⟵ ⟶ off

USB-C port (charging)

configuration button and LED

charging LEDs

# Contents

# 1 INTRODUCTION

Thank you for purchasing and using DroneBeacon products!

The latest version of this user manual may be downloaded at the following link:
https://download.bluemark.io/db120.pdf

(Direct/Broadcast) Remote Identification (Remote ID) adds "beacon" capability to drones to broadcast basic information of airborne drones, such as the operator's registration number, drone serial number and current position. The EU and USA have new rules that make Remote ID mandatory for drones over 250 grams weight. The beacon information can be used by general public, law enforcement and drones to give better situation awareness of the airspace around them.

BlueMark Innovations BV offers Remote ID transponders and receivers. DroneBeacon db120 is an add-on (transponder) for drones that broadcasts Remote ID beacon signals. Besides the db120 we also provide other Remote ID add-ons. DroneScout is a receiver that detects Remote ID signals of nearby drones up to several km distance (in open space). See https://dronescout.co for more information about our products.

## 1.1 Audience

This document is intended for users that want to use the *DroneBeacon db120* transponder as a stand-alone Remote ID add-on for their drone or other UAV product.

## 1.2 Specifications

The transponder consists of an embedded system and several radio-interfaces to broadcast Remote ID signals.

In the EU, the db120 is a *Direct remote identification (DRI) Add-on*. DRI Add-ons are considered as payload in the EU. DRI means a system that ensures the local broadcast of information about a Unmanned Aircraft (UA) in operation, including the marking of the UA, so that this information can be obtained without physical access to the UA. A DRI Add-on is standalone direct remote ID broadcast device integrating a GNSS function and a communication. function, being able to provide position, height, speed over ground, track clockwise with true north, of the UA, and it's take-off position. In the USA, the db120 is a *Remote ID broadcast module*.

**Regulation**
The db120 transponder complies and adheres to the following regulations:

| region | | |
|---|---|---|
| EU | DELEGATED REGULATION (EU) 2019/945 PART 6 | March 2019 |
| | DELEGATED REGULATION (EU) 2020/1058 | April 2020 |
| | ASD-STAN FprEN-4709-002:2023 (E) (Part 002: Direct Remote Identification) | June 2023 |
| USA | ASTM, International (ASTM) F3586–22, with additions | July 2022 |

The EU Declaration of Conformity can be found here:
https://dronescout.co/wp-content/uploads/2023/09/EU-DoC_standalone.pdf

Key specifications:

- **Compliant with international regulations**
  - ■ EU         ASD-STAN DIN EN 4709-002
  - ■ USA        ASTM Remote ID Standard ASTM F3411-22a-RID-B/ F3586-22
    - ◆ Accepted by the FAA https://uasdoc.faa.gov/listDocs/RID000000058
- Supports **all Remote ID transmission protocols**:
  - ■ BLE legacy
  - ■ BLE long range
  - ■ WLAN NaN 2.4 GHz (not allowed in the USA)
  - ■ WLAN Beacon 2.4 GHz
- **Long range** up to 5 km detection range[1]
  - ■ Omni-directional antenna with 0 dBi gain
  - ■ Transmit power: +18 dBm (WLAN and Bluetooth)
- Battery life: > 3 hours[2]
  - ■ 2 Wh (LiPo 3.7V 600 mAh)
- Positioning
  - ■ GPS and BDS: 2.5m positioning precision
- Suited for outdoor operation:
  - ■ IP43 rating
  - ■ for operation in rainy conditions, the transponder needs to be protected against water.
- Dimensions (l x w x h): 48 x 38 x 28 mm.
  - ■ with screw nodes the dimensions are 48 x 51 x 28 mm
- Operating temperature
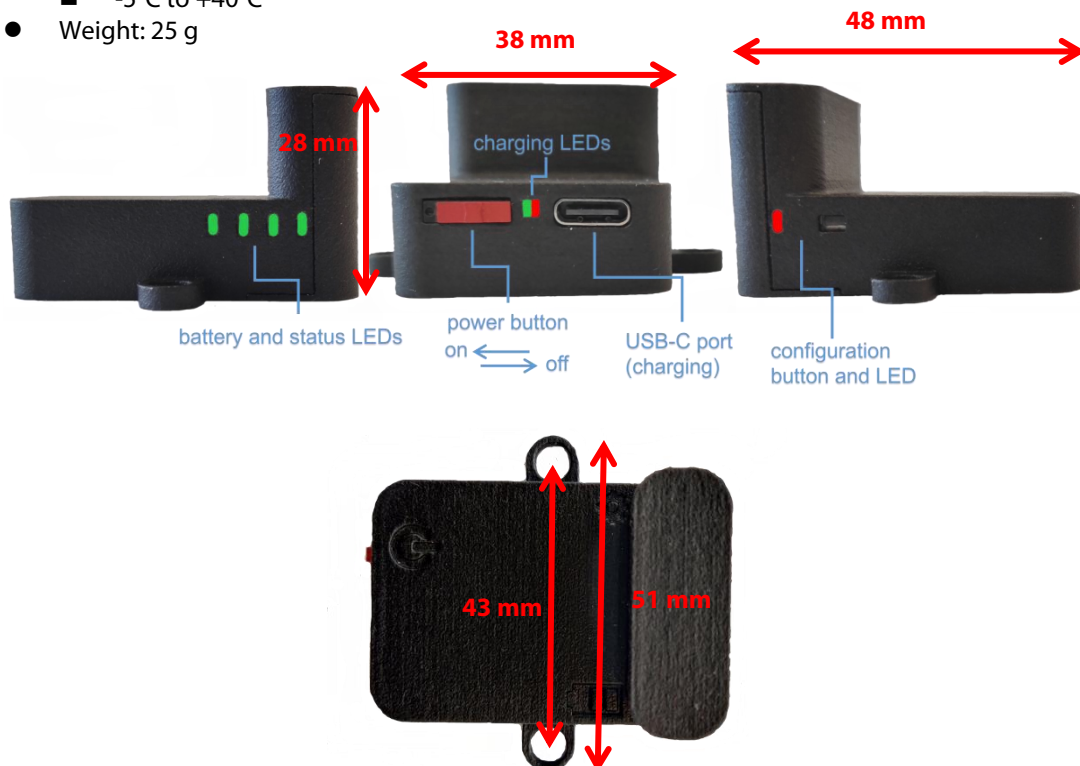  - ■ -5°C to +40°C
- Weight: 25 g





Figure 1 - DroneBeacon 120-serie transponder

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[1] The detection range depends on several factors such as the receiver antenna gain, transmission protocol, weather conditions, flying height, receiver height line of sight etc. With professional receivers a range up to 5 km is possible. See our DroneScout manual for more details.

[2] The battery life has been measured at room temperature. The battery life will be shorter, if it is used below 10 degrees Celsius. It also depends on other factors like transmission mode and transmission period. WLAN transmission modes have much shorter battery life: > 1 ½ hours.

## 1.3 What's in the Box

The following package contents should be present:
- 1x db120 transponder
- 3x 3M dual-lock stickers (1 extra)

## 1.4 Charging

The transponder can be charged using a standard USB-C charger. It is fully charged within 1 hour (45 minutes with a USB fast charger). During charging, the charging LED will be *red*. If fully charged, this LED will turn to *green*.

## 1.5 Installation

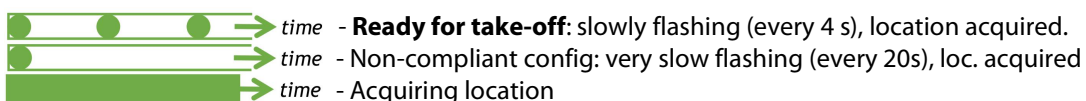Attach the DroneBeacon db120 transponder on the top of your drone for best performance.

- Use the 3M dual lock™ stickers (included).
  clean the surface and remove the foil of the 3M dual lock sticker, apply firm pressure Use a sticker for both the db120 and drone. Snap the db120 to the counter part sticker on the drone. The stickers allow you to easy remove or attach the db120.
  *Note: for a good adhesion/grip, place the dual-lock sticker and apply firm consistent pressure to assure good contact with the substrate you are adhering. Also, it needs 1 hour to 72 hours (preferred) to build a (full) adhesion to the surface. In addition, it is important that the adhesive base for the tape is free of grease and dry, and that it is not covered with a removable lacquer or a layer of paper.*

- Or/and use two M5 screws.
  The transponder can be attached to the drone using two M5 screws. The distance between the two screw noses is 43 mm.

## 1.6 Using the db120

- Attach the transponder to the drone
- Move the on-off power switch to *on* to power up the transponder.
- Wait for a GPS fix (slowly flashing battery LEDs every 4 seconds). The battery LED indicates the battery level in steps of 25%. This is typically within 90 seconds if the db120 is used outdoor.
- You are ready to fly.
- After your flight, turn the db120 off using the on-off power switch.

**Battery/status LED**
The status LED can have the following states:

*time* - **Ready for take-off**: slowly flashing (every 4 s), location acquired.
*time* - Non-compliant config: very slow flashing (every 20s), loc. acquired
*time* - Acquiring location

Note:
- For typical use in the USA no configuration is required. USA: use the db120 S/N number for registering your drone at the [FAA](#).
- For the EU, you need to enter your operator ID and UA class. See section 2.2.
- A non-compliant configuration can be caused by selecting a non-compliant transmission protocol, selecting a lower transmit power (for WLAN modes) or selecting a different channel for WLAN modes than the default channel 6.

*Flying a drone could create risks for people, air traffic and other assets. Before flying, the drone operator has to make sure to know the local rules regarding drone flights and obtain the necessary authorization to fly the drone(s).*

## 1.7 EMC test

To verify that the db120 does not produce interference to the drone or receives interference from the drone, it is advised to do a quick EMC test. (Only when attached for the first time to a drone.)

- Power on the drone and remote control. Keep the db120 powered off.
- Verify that the drone, remote control and wireless link are functioning properly.
- Power off the drone and remote control.
- Power on the db120. Keep the drone and remote control powered off.
- Verify that the db120 is functioning properly. For instance by using the Android in Section 1.8 or by looking at the status LEDs (ready for take-off state).
- Repeat the tests by powering on both the db120, the drone and remote control. If both the db120 and drone, remote control and wireless link are functioning properly, there is no EMC interference between both systems.
- In case there is interference, please move the db120 to a different place on the drone and repeat the tests. Alternatively lower the output power or change the transmission protocol.

## 1.8 Android/iOS app

You can use the free *OpenDroneID OSM* Android app to view the DroneBeacon Remote ID signals:
https://play.google.com/store/apps/details?id=org.opendroneid.android_osm

Or the Drone Scanner Android app:
https://play.google.com/store/apps/details?id=cz.dronetag.dronescanner

Note: only few Android smartphones support reception of Bluetooth Long Range and/or WLAN NaN signals. Also, in default Android configuration, WLAN Beacon signals are typically received only once every few minutes. A list of supported smartphones is presented, in the link below.
https://github.com/opendroneid/receiver-android/blob/master/supported-smartphones.md

**iOS**
The Drone Scanner app is also available for iOS. Due to limitation of iOS only BT4 reception is possible.
https://apps.apple.com/gb/app/drone-scanner/id1644548782

## 1.9 Open Drone ID

DroneBeacon uses the Open Drone ID framework to broadcast Remote ID signals. The framework can be found on this page: https://www.opendroneid.org/

## 1.10  LiPo battery

DroneBeacon uses internally a LiPo battery. In general LiPo batteries are safer and more environmentally friendly than other batteries like NiCd and NiMH. While LiPo fires are rare, they can happen incredibly quickly and can do a lot of damage[3]. **Always use a fire proof LiPo safety bag, metal ammo box, or other fire proof container** when you are charging, discharging, or storing db120 transponders.

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[3]  https://www.thedronegirl.com/2015/02/07/lipo-battery/

# 2 CONFIGURATION

The transponder can be configured via a web-interface. To active the configuration mode follow these steps:

- Move the on-off power switch to *on* (to power up the transponder).
- Press the configuration button, the *red* configuration LED is turned on.
- Connect to the *dronebeacon* WLAN network (no password needed)
- Point your browser to http://192.168.50.1
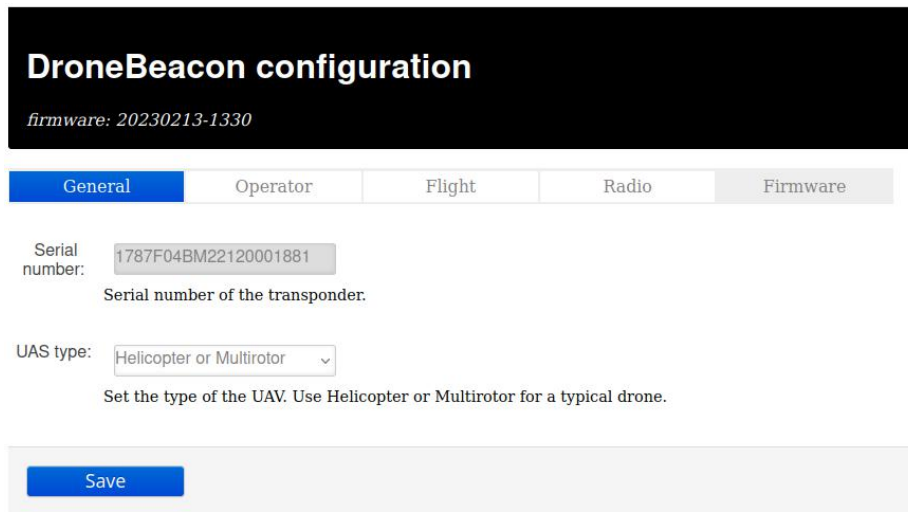
New settings will only be applied if the Save button is pressed!

Configuration mode will be quit, by pressing the configuration button again. The *red* configuration LED is now turned off. The transponder is now in normal operation mode.



*configuration web-page*

## 2.1 General

The main configuration can be found on the general tab.



*Figure 2 - General configuration page*

Fill in the drone type of your drone.

## 2.2 Operator

In the operator tab, you can configure the details of your license provided by the National Aviation Authority. This is an optional setting for the USA. In the USA you need to use the serial number of the db120 instead for register your drone at the FAA. For the EU, this is a mandatory setting. *First, select the region where the drone is flying*. Outside the EU, no UAS category or UAS class is required.

Within the EU, only valid license numbers can be entered. In that case the input box becomes green.





*Figure 3 - Operator configuration page*

## 2.3 Flight

In the flight tab, you can configure an *optional* text describing the purpose of your flight.

*Figure 4 - Flight configuration page*

## 2.4  Radio

In the radio tab you can configure the transmission mode and other radio-related settings. Most users don't change settings in this section. Note that in the USA only BLE dual-mode and WLAN broadcast transmission mode are allowed.

*Figure 5 - Radio configuration page*

## 2.5 Firmware

In the firmware tab, you can upgrade the firmware of the transponder.

Firmware files can be found here: https://dronescout.co/downloads/
(Version history: https://download.bluemark.io/dronebeacon_transponder_history.txt)

Upload the file and press Flash image to upload new firmware. Upgrading firmware has been tested with Chrome and Firefox. If upgrade fails, please try again or try another browser.

**DroneBeacon configuration**

*firmware: 20230213-1330*

| General | Operator | Flight | Radio | Firmware |
|---------|----------|--------|-------|----------|

Firmware file: [Browse...] No file selected.

Select the new firmware (with extension bin) and press the flash image button to upgrade. If flashing fails or you flash the wrong file, it will automatically fallback to the previous firmware version.

[Flash image]

**After pressing the flash image button, the device will automatically reboot within 30 seconds. Press the cfg-button on the device again to check the running firmware.**

*Figure 6 - Firmware upgrade page*

# 3 TROUBLESHOOTING

**Access to the configuration web-pages fails.**
Failing to access the configuration web-pages can have multiple causes. Make sure the configuration LED is solid red. Also, make sure that you connect to the *dronebeacon* network. If you get a message that the network does not provide internet, make sure you decline the message to disconnect and connect to your default WLAN network again. The browser *Safari* can also give issues to connect to the configuration web-pages. Use a different browser in this case. Also, a VPN, browser add-ons or another active internet connection can give issues. Disconnect the VPN and other internet connections. The easiest solution is use a different device to connect to the configuration pages.

**The configuration LED and some battery LEDs glow softly when the db120 is powered on.**
If the configuration button is stuck, the db120 will not boot normally, but instead will enter a special boot mode. If this is the case the configuration LED and a few battery LEDs will glow softly. To solve this, make sure that that the configuration button is not pressed or is stuck by the enclosure.

**The reported height is wrong.**
The db120 uses the GNSS (GPS) signal to determine the height of the db120. It needs a good GPS reception/fix for this purpose. Make sure you install the db120 on top of your drone. Also, db120/GNSS receiver has issues to track slow vertical speeds. Make sure you always go up or down with at least 1 m/s vertical speed for your drone.

**The db120 interferes with the drone communication link.**
Move the db120 to a location further away from the drone communication antenna. Even 10 cm extra distance can make a huge difference. See also section 1.7 EMC test. In addition, change the transmission protocol if the interference persists. Typically, Bluetooth transmission protocols cause less interference to other radio systems. Also a lower the transmit power will reduce interference.

**The db120 gets no GPS lock/location data.**
In normal outdoor situations, the db120 gets a GPS fix typically within 90 seconds. In indoor locations or blocked GPS reception, a GPS fix may take considerably longer or not all. Please contact us, in case the GPS fix takes always a very long time or there is no GPS fix at all.

**After the db120 is switched on, no battery LEDs are turned on or are quick flashing.**
In this case the battery is likely empty. Charge the db120 fully. If some rare cases, the db120 battery LEDs flash quickly (much faster as with a normal GPS fix) without broadcasting any Remote ID signals. This can be caused by a too low battery level. Charge the db120 fully.

# 4 LIMITED WARRANTY

The product has a two-year warranty period, starting at the date of receiving the product. Outside warranty are issues like crash damage, improper use, (extreme) weather conditions that damages the product. Also, the battery is excluded from warranty. The product is eligible for future firmware updates as described in the section 2.4 firmware.

**Warranty Service**
Please email or call us first with a description of the problem. Typically, the customer is responsible for transportation costs to our office. For post-warranty cases contact us too; we will try to do our best to find a solution.

# 5 MORE INFORMATION

If you need more information, please contact us at info@bluemark.io or by phone: +31 53 711 2104.

All contact information can be found at the *DroneScout* contact page:
https://dronescout.co/contact/

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