

User Manual

G-1090

Swiss Made Air Traffic Signal Receiver
Version 1.2 (June 9th, 2021)



INVOLI

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INTRODUCTION

INVOLI wishes to thank you for the purchase and use of INVOLI products.

The latest version of this user manual may be downloaded at the following link, where the most up-to-date version hereof will be found at all times:

<https://www.involi.com/pages/user-manual>

(you should be registered in involi.com to access this page)

INVOLI provides the necessary data for the safe and efficient integration of drones in the air traffic. INVOLI.live platform allows users to visualize the position of INVOLI's drone trackers, together with the air traffic detected by the INVOLI's receivers. The drone pilot uses the information provided by the INVOLI.live system to improve the situational awareness of their drones and react appropriately when an aircraft is approaching.



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).

Contact us if you have any feedback on the INVOLI system at info@involi.com. If you need

assistance with one of the INVOLI products, contact us at support@involi.com.

You can find INVOLI's updated Terms of service at the following link:

<https://www.involi.com/policies/terms-of-service>

INVOLI's Privacy Policy can be found at the link below:

<https://www.involi.com/policies/privacy-policy>

INITIAL NOTICE

Thanks for purchasing the G-1090 air traffic signal receiver.

In its box, you will find the following items:

- A G-1090 air traffic signal receiver
- A ADS-B 1090 MHz antenna
- A silicon rubber tape

If you have purchased a G-1090F or G-1090FA, the following items are also included:

- A FLARM Antenna

With your first purchase at INVOLI, the following software is included:

- An individual license for INVOLI.live BASIC
- An individual license for INVOLI API & Stream

What else do you need to know:



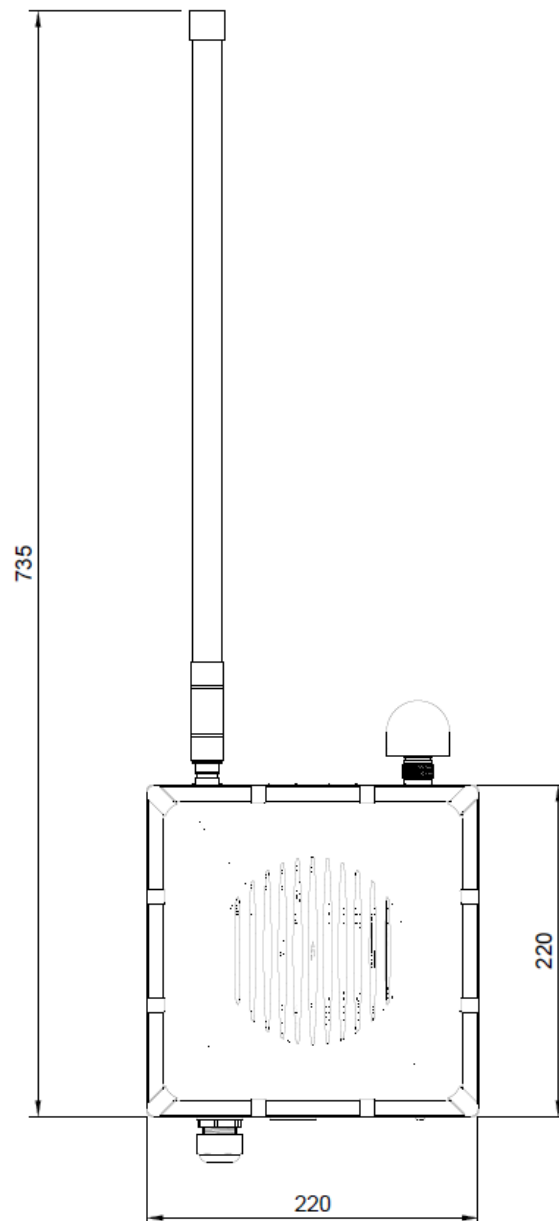
- The reception quality of the G-1090 is strongly dependent on the quality of the installation. Please follow carefully the instructions contained in this manual, in order to maximize the coverage of your receiver(s)
- If you are going to use an LTE PoE router, check the coverage for your carrier in the area you want to use the G-1090 receiver
- Detection of Mode S and Mode A/C aircraft is only possible via Multilateration
- Multilateration is only possible when the signal emitted by the aircraft is received by multiple G-1090 receivers (ideally 4, but more is better). The configuration of the devices and the position of the aircraft have an impact on Multilateration precision.
- Aircraft equipped with ADS-B and FLARM are broadcasting their position at regular intervals. On the other side Mode S and Mode A/C aircraft broadcast their signal only when interrogated by a Secondary Radar. For this reason, the detection of such devices is possible only when 1030 MHz radar interrogations are present.
- Aircraft not equipped with a transponder (non-cooperative air traffic) are not visible by the receiver.
- The data acquired from the G-1090 receiver is visible only via INVOLI.live BASIC, INVOLI.aero and INVOLI API and STREAM

G-1090 RECEIVER SPECIFICATIONS

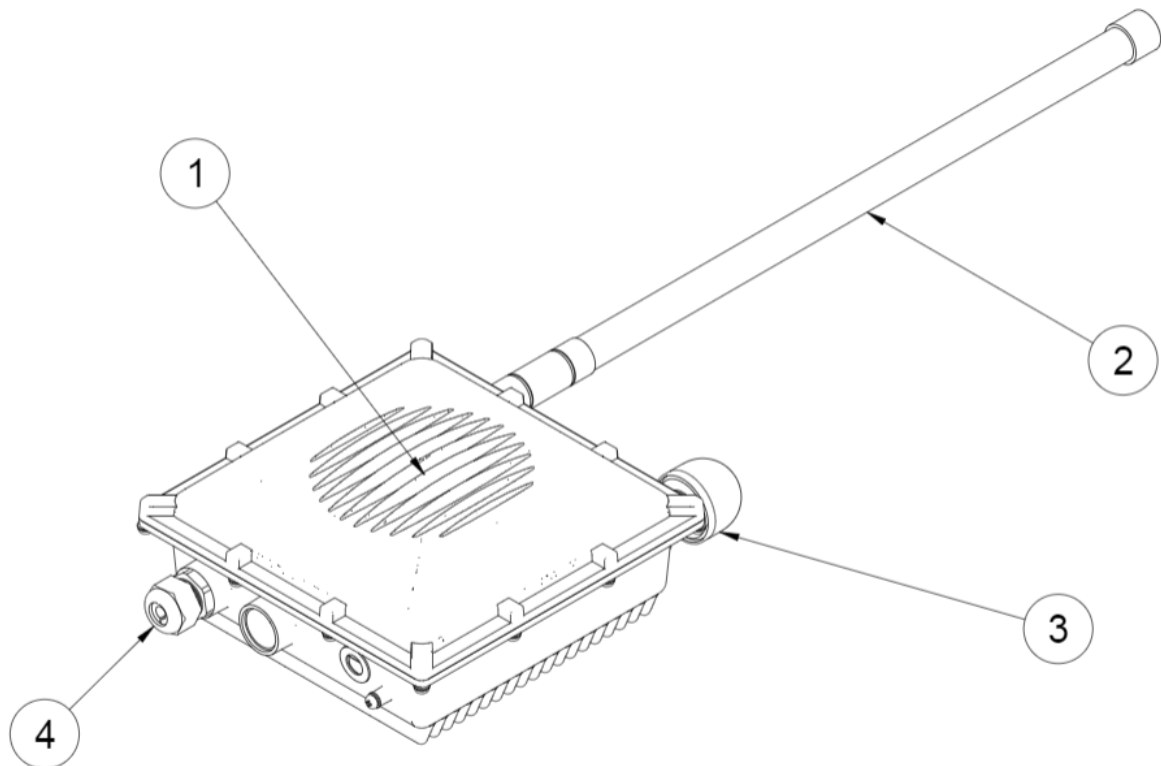
- Reception of 1090 MHz frequency
- Measure of local atmospheric pressure, to compensate pressure altitude
- Communication and power via Power Over Ethernet (PoE)
- Rugged box for mounting in exterior (IP67)
- Surge protection
- Power consumption 15 Watts
- Data consumption up to 2 GB /day

Options:

- Detection of FLARM aircraft (models G-1090F and G-1090FA for America)
- Internet connectivity via Router 4G (SIM card not provided)
- Power adapter from 110V/220V to PoE



WHAT IS THE **G-1090** RECEIVER



1. Receiver IP68 box
2. 1090MHz Antenna
3. GNSS Antenna
4. Waterproof RJ45 Ethernet socket (for PoE input)

G-1090 is Swiss made air traffic signal receiver, developed for fixed exterior mounting, having a rugged IP68 case that allows the receiver to resist any weather condition. Once the G-1090 is configured and connected to the internet, it will start transmitting to INVOLI Server the air traffic messages received. The data provided by the G-1090 is used to feed INVOLI Multilateration, transforming simple aviation signals (like Mode A/C) into air traffic positions. To visualise the air traffic, it is possible to use a display platform, namely INVOLI.live, or to integrate its data stream in a third-party software - like an UTM or a drone ground control software - using the INVOLI API and Stream.



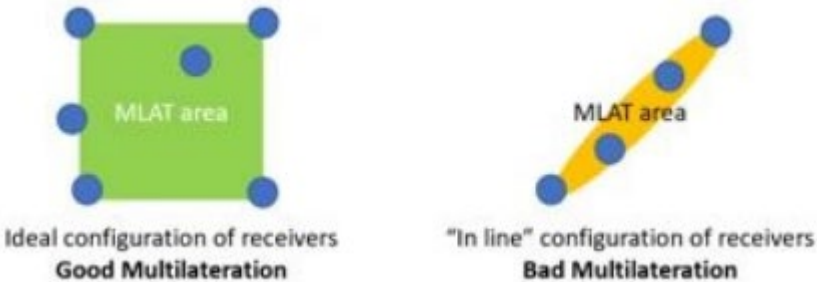
MULTILATERATION

INVOLI MLAT (MULTILATERATION) is a server-based software that unleashes the true power behind the G-1090 receivers. Connected to a network of receivers, it calculates and validates the position of air traffic emitting signals on the 1090 MHz frequency. The algorithm calculates the position of the aircraft by comparing the times of arrival to the same message to different receivers. Thanks to Multilateration, it is possible to calculate the position of Mode S and Mode A/C aircraft, and validate the position of ADS-B aircraft.



It is important to understand that Multilateration results are strongly dependent on the multiple parameters such as:

- 1. The number of G-1090 receivers that receive the same message (the more the better).
- 2. The position of the aircraft relative to the G-1090 (the more the aircraft is located in the center of the G-1090, the more accurate the result)
- 3. The initial configuration of the G-1090. The G-1090 receivers should be arranged in order to create a "polygon", and the area inside the polygon will be where the Multilateration converges the best. A layout along a line will not give good results in terms.



For point 1., notice that the less powerful transponder will transmit their signal at maximum 10-20 km of distance, while the most powerful one can be received up to 400 km of distance. This has to be kept in account when choosing the number of G-1090 receivers and their location.

INSTALLATION RECOMMENDATIONS

Aviation signals over the 1090 MHz (ADS-B, Mode S and Mode A/C) and FLARM are detectable on line of sight. This means that your receiver will be able to detect air traffic in the areas which are visible from the spot where you are going to install the device.

Any obstacle (mountains, buildings, trees and so on) will limit the reception along the obstacle direction. Therefore, to optimize the coverage, we strongly recommend installing the device on top of hills of mountains, over rooftops of buildings, or over light poles, or any tall and isolated structure.

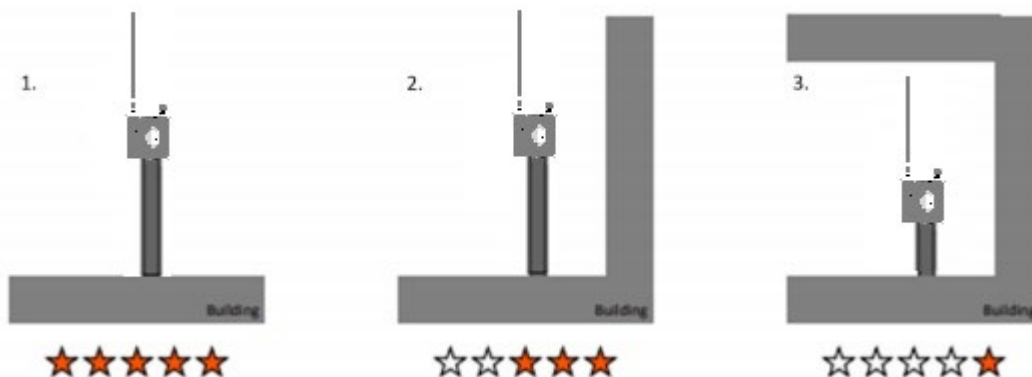
The G-1090 receiver could be installed outdoor or indoor (especially if the building or construction is in wood).

OVER A POLE



The antenna(s) should be placed on the pole, in such a way that the pole itself is not hiding the antennas (1.). If not possible, it is strongly recommended to place the antennas at least 35 cm of distance from the pole itself (2. and 3.), in order to avoid reflections of signals. Installing the receiver behind another device or too close to an emitting device is strongly not recommended.

OVER A BUILDING



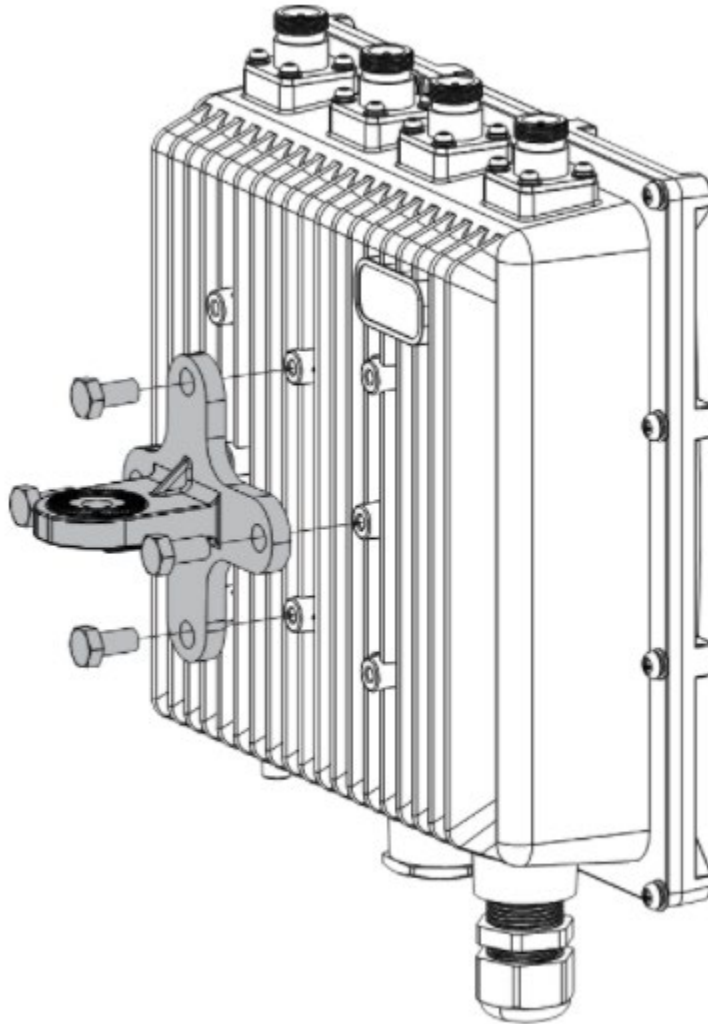
The antenna should be placed on the top of the structure (1.). If not possible the receiver should be placed to optimise the line of sights (2.). Installation into a concrete building (3.) are not recommended. There is no problem in installing the receiver into wooden structures.

INSTALLATION PROCEDURE

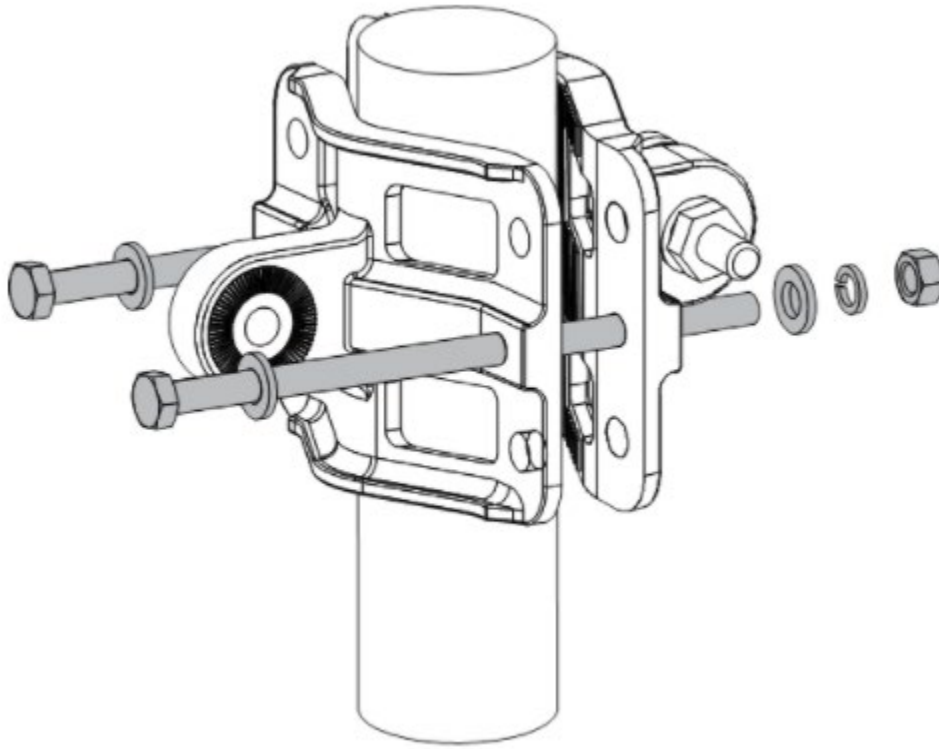
Instructions on mounting and securing the mounting kit to the enclosure and the bearing pole.

*If needed The G-1090 can be mounted on a horizontal pole by not using the 90° angle converter part.

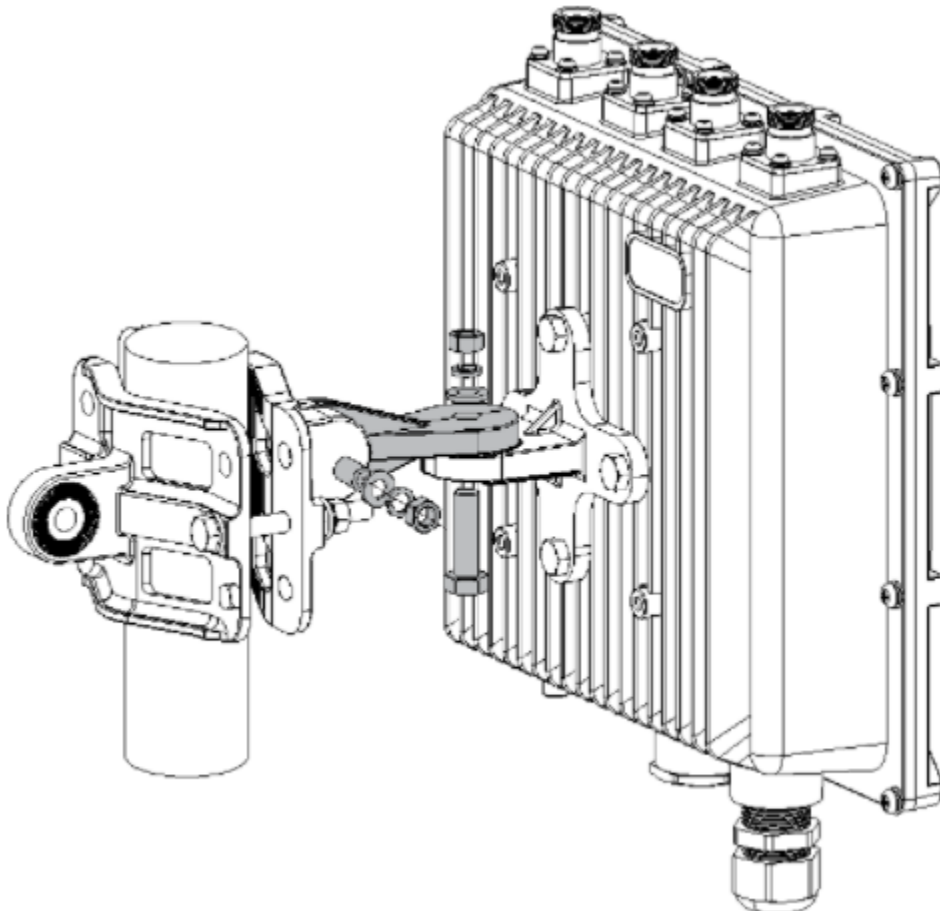
1. Fix the included cross bracket on the bottom of the enclosure with four M6*12 bolts.



2. Place two pieces of the clamp around the pole and tighten them with the included M6*110 bolts, washers, and nuts.



3. Connect the pole clamp and the cross bracket by securing the last piece of the mounting kit in place using M6*30 bolts, washers, and nuts.



CONNECTION TO A NETWORK



All your Ethernet cables should be at least CAT6 and shielded.



DIRECT

If your network is equipped with Power over Ethernet (PoE), simply connect an ethernet cable the G-1090 ethernet socket. As soon as the connection is made, the device will turn on.

The G-1090 uses DHCP to find its own dynamic address over a private network. Please contact us if you need information for firewall configuration.

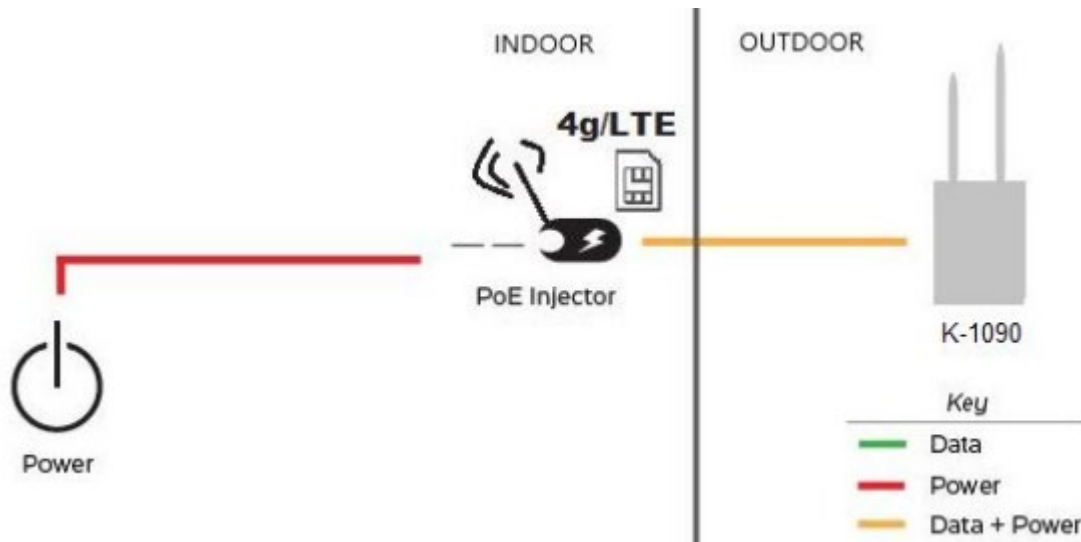
PoE ROUTER

If your internet access is not equipped with PoE, you can purchase a PoE injector (available on INVOLI catalog of spare parts and accessories). The injector has to be connected to the internet with an ethernet cable and to the power. Then, simply connect the ethernet cable from the G-1090 and the receiver should turn on.



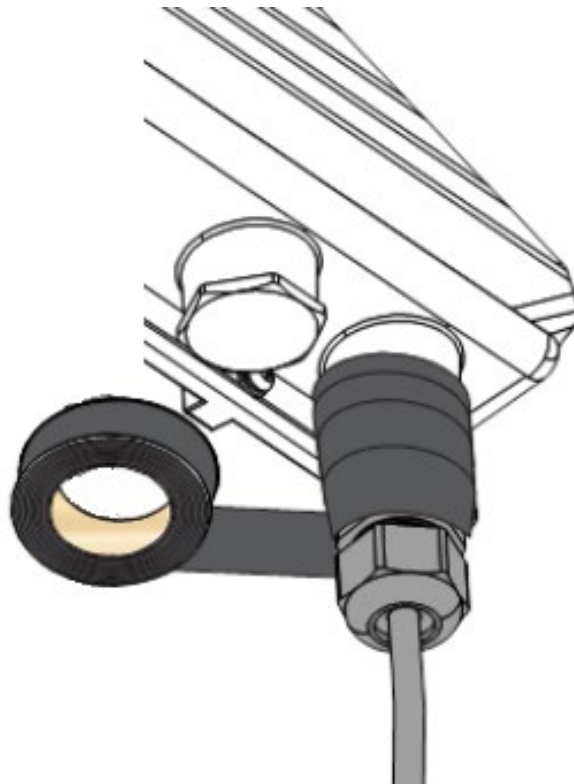
LTE PoE ROUTER

If you are installing a G-1090 where there is no access to internet you can purchase a PoE LTE router (available on INVOLI catalog of spare parts and accessories). The installation is similar to the one of the PoE router, with the difference that you have to install in the router one or two SIM cards (for redundancy) and internet access will be provided over 4G LTE.



To better protect the Ethernet cable gland and the antenna connector from the weather, you can cover them with PVC tape.

Clean the surface area of the connector that will be wrapped. Wrap a layer of PVC tape with a 50% overlap according to the rotation direction of the connector. Continue wrapping the PVC tape to about 10 mm below the end of the connector.



INVOLI.live

INVOLI.live is the platform that allows you to visualize the air traffic detected by your G-1090 receiver, together with the traffic detected by all other INVOLI G-1090 receivers.



Please refer to the INVOLI.live user manual available at the following link for initial configuration and usage:

<https://www.involi.com/pages/user-manual>