MALÅ GeoDrone 600

User Guide

Our Thanks...

Thank you for choosing Guideline Geo and MALÅ as your Ground Penetrating Radar solution provider. The core of our corporate philosophy is to provide our users with the best products, support and services. Our development team is committed to providing you with the most technologically advanced and easy-to-use GPR products that can meet your efficiency and productivity needs now and in the future.

Whether this is your first MALÅ product or an addition to the MALÅ collection, we believe that a small investment of your time to familiarize yourself with the product by reading this manual will be rewarded with a significant increase in productivity and satisfaction.

At Guideline Geo, we highly value your feedback on the use and experience of our products and the contents and usefulness of this manual. Your comments are crucial in our continuous efforts to improve our products and services.

Guideline Geo team

Guideline Geo AB

http://www.guidelinegeo.com

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Preface

About this Manual

This manual is written for the end user, explains how to set up and configure the product, and provides detailed instructions on its use.

Additional Resources

GPR Training	https://www.guidelinegeo.com/training-gpr-resistivity-seismics-tem/
GPR Method	https://www.guidelinegeo.com/ground-penetrating-radar-gpr/
GPR Applications	https://www.guidelinegeo.com/application-areas/
GPR Case Stories	https://www.guidelinegeo.com/solutions/case-stories/

Feedback

Feedback regarding the contents of this manual or the product may be sent by using any of the channels found at https://www.guidelinegeo.com/contact/

Safety and Compliance User Notices

This GPR device is certified according to IC RSS-220 and ETSI EN 302 066-1&2.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

According to the regulations stated in ETSI EN 302 066-1 (European Telecommunication Standards Institute):

- The control unit should not be left **ON** when leaving the system unattended. It should always be turned **OFF** when not in use.
- The antennas should point towards the ground, walls etc. during measurement and not towards the air.
- The antennas should be kept in close proximity to the media under investigation.

Canadian regulations state that whenever GPR antennas are in use the following notes apply:
This Ground Penetrating Radar device shall be operated only when in contact with or within 1 m of the ground.

Only law enforcement agencies, scientific research institutes, commercial mining companies, construction companies and emergency rescue or firefighting organizations shall use this Ground Penetrating Radar Device.

This device complies with Industry Canada license-exempt RSS standards. Operation is subject to the following two conditions: (1) This device may not cause interference and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

French translations
Cet instrument de Géoradar se devra d'être opéré seulement en contact à même le sol ou en deça d'un mètre du sol.

Cet instrument de Géoradar se devra d'être utilisé seulement par les agences chargées de l'application de la loi, les instituts de recherches scientifiques, les compagnies minières à buts lucratifs, les compagnies de construction et les organisations responsables pour le sauvetage et la lutte contre les incendies.

Cet instrument répond aux exigences de la licence avec Industrie Canada- exempt des standards RSS. L'opération est sujette aux deux conditions suivantes : (1) Cet instrument ne peut pas causer une interférence et (2) cet instrument se doit d'accepter quelque interférence que ce soit, incluant une interférence qui pourrait causer une opération non-souhaitable de l'instrument.

Radiation Exposure Statement

To comply with ISED RF exposure compliance requirements, a separation distance of at least 20 cm should be maintained between the EUT and all persons during normal operation.

French translation
Pour se conformer aux exigences de conformité d'exposition ISDE RF, une distance de séparation d'au moins 20 cm doit être maintenue entre l'EST et toutes les personnes pendant le fonctionnement normal.

Unpack. Inspect. Register

When unpacking the equipment, handling it with great care is crucial. Be sure to verify the contents on the packing list and inspect the equipment and accessories for any loose parts or other damage. This step is essential to ensure the equipment's integrity and safety during use.

Note: The packing list included with the shipment should be read carefully, and any discrepancy should be reported to our sales department at www.guidelinegeo.com.

Note: All packing material should be kept if any damage occurs during shipping.

File any claim for shipping damage with the carrier immediately after discovering the damage and before the equipment is used. Any missing equipment or parts claims should be filed with Guideline Geo within fourteen (14) business days of receiving the equipment.

Repacking and Shipping

The Guideline Geo packing kit is specially designed for shipping the MALÅ GeoDrone 600 unit. The packing kit should be used whenever shipping is necessary. If the original packing kit is unavailable, pack the instrument in a large box to allow at least 80 mm of shock-absorbing material to be placed all around the instrument. This includes the top, bottom and all sides.

Warning: Never use shredded fibres, paper or wood wool, as these materials tend to compress and permit the instrument to move inside its packing box.

Please read our shipping instructions before returning instruments to Guideline Geo. These instructions can be found on our website at www.guidelinegeo.com/Support/Service-Repairs

Registering MALÅ GeoDrone 600

By registering your equipment, you ensure that you receive up-to-date documentation, software upgrades, and product information. This will help you optimize the utilization of the equipment and realize the maximum return on your investment.

To register your equipment, visit www.guidelinegeo.com/product-registration on our website and submit the registration form.

Note: The serial number is found on the side of the MALÅ GeoDrone 600 unit.

MALÅ GeoDrone 600

The MALÅ GeoDrone 600 is an air-borne GPR unit for efficient field work, designed specifically for data collection in remote, hazardous, and inaccessible areas where ground-based GPR surveys are impossible. MALÅ GeoDrone 600 enables effectively collecting GPR data in various environments, such as snow-covered ground, rocky and uneven terrain, across rivers, lakes and avalanche-prone areas.

Note**:** Data quality and depth penetration of any GPR antenna improves when the unit is operated closer to the ground or other media of investigation, e.g. water surface, ice or snow. The MALÅ GeoDrone 600 is intended for use in close proximity to and always within 1 meter of the ground (subject to ETSI and FCC/IC regulations).

The MALÅ GeoDrone 600 unit

The MALÅ GeoDrone 600 is a one-piece GPR unit containing the transmitter (Tx) and receiver (Rx) antennas and a control unit and power.

On the MALÅ GeoDrone 600 unit, the following items are found:

- Connection for GNSS antenna
- Safety Wire
- Wi-Fi antenna*
- Power In connector
- On/Off button
- Battery compartment

Side view (with connection for GNSS antenna, Wi-Fi antenna, Power In connector and On/Off button).

Top view (with the safety wire above and the Wi-Fi antenna below).

**In compliance with regulatory requirements, the provided Wi-Fi antenna MUST NOT be replaced or modified. The antenna is securely fastened to the connector with adhesive to prevent unauthorized modifications. For assistance or service related to the antenna, please get in touch with Guideline Geo Support.*

Bottom view, with battery compartment.

Safety wire

The MALÅ GeoDrone 600 comes equipped with a safety wire that needs to be connected directly to a secure mounting point of the drone.

In the event of a failure in the mounting arrangement, the safety wire ensures that the GeoDrone 600 remains tethered to the drone. This is crucial for protecting operators, bystanders, and the unit itself.

Positioning

The MALÅ GeoDrone 600 comes with an external GNSS antenna. This antenna is connected to the designated GNSS connector on the side of the unit and positioned on top of the carrying drone for optimal reception. The internal GNSS receiver will not work unless this external GNSS antenna is connected correctly.

The MALÅ GeoDrone 600 supports PPS (Pulse Per Second) for post-survey position synchronization with an external RTK-GNSS device.

A connection for the external GNSS antenna is found on the side of the GeoDrone 600 unit. The connection is marked GNSS.

External GNSS antenna provided with the MALÅ GeoDrone 600.

Note: The external GNSS antenna is magnetic; attach it securely on top of the drone with double-sided tape or something similar.

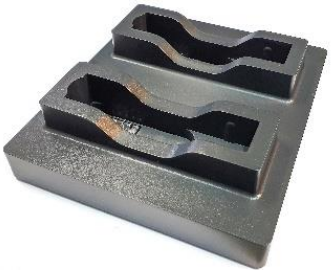
Power

A single battery powers the MALÅ GeoDrone 600. This is found under the hatch on the central unit (bottom side). A fully charged battery gives a measurement time of 1+ hours (depending on settings). The battery can be charged with the supplied battery charger.

The GeoDrone 600 has an automatic power-down feature. If the unit is not measuring and not connected to the MALÅ Controller App for 30 minutes, it will automatically power down. This feature helps to reduce power consumption when the device is not in use.

To reactivate the unit, press the power button and follow the standard startup procedure outlined in this guide.

The Power In connector, PWR IN, powers the unit using an external power source. The accepted voltage using this input is 12-24VDC. Open-ended power cables are available for users to adapt as an accessory. The internal battery is not needed if an external power source is used. Please get in touch with Guideline Geo or your local representative for more information.



Note: Make sure the protective cap is attached when not using external power.

System set up

Ensure the battery is charged and the hatch of the battery compartment is closed correctly.

Attach the MALÅ GeoDrone 600 to your drone.

Note: Attach the safety wire to a secure mounting point on the drone.

To prevent damage to the equipment, ensure the MALÅ GeoDrone 600 is securely attached before flight and do not use the GeoDrone 600 as landing gear.

A complimentary payload mounting kit is available for easy attachment to standard drone models. See *Appendix* for further information.

Please get in touch with Guideline Geo or your local representative for information on extended warranty if needed.

Connect the included GNSS antenna. Attach the GNSS antenna to the top of the drone for best reception.

Now you are ready to power up the MALÅ GeoDrone 600 and start the data acquisition software, MALÅ Controller App.

Note: The weight of the GPR system will affect the flight characteristics.

Note: Land the drone smoothly and carefully so as to not harm the equipment.

Data acquisition

Data is acquired with the MALÅ Controller App installed on a Samsung Galaxy Active Pro 5G tablet. For more information regarding connection, settings, measurements, data recovery and storage, see *MALÅ Controller App Quick Guide* and *User Guide*.

Best practices for airborne GPR surveys

- Ground-based GPR surveys will always produce better results and are recommended whenever possible.
- As the GeoDrone antenna is airborne, air reflections will be visible in the data. These need to be correctly identified to avoid interpretation errors.
- Correct positioning is vital to the success of many applications, especially when attempting to locate near surface point targets.
- The drone used for the surveys must have high-precision RTK GNSS positioning, and the GPR data (positioning of traces) needs to be post-synced with the RTK GNSS positions after each survey to ensure sufficient accuracy of measurements.
- It is recommended to use route planning software. This software must enable flights of less than 1 m above ground surface. Some standard route planning tools from drone manufacturers don't allow routes below 2 m flight height.
- The survey height needs to be maintained throughout the survey to enable correct interpretations of the collected data (or the flight height needs to be corrected after the survey when post-processing the results).
- If collecting data in one single long file, turn outside the investigation area to avoid artefacts in the data used for interpretation.
- Slowing and speeding up the drone will likely make the antenna unlevelled/tilting. The GeoDrone 600 can be mounted a bit tilted to avoid some of these effects.

Flight direction

When mapping elongated objects such as utilities, it is recommended to use a broadside perpendicular mode for the data collection. The measurements can be made in any direction for mapping point objects and layers, including broadside perpendicular or broadside parallel. See examples below.

Use broadside perpendicular mode when mapping elongated objects as utilities. Set the flight direction according to the arrows for these types of investigations.

Measurements for mapping point objects and layers can also be carried out in broadside parallel mode. Set the flight direction according to the arrows for these types of investigations.

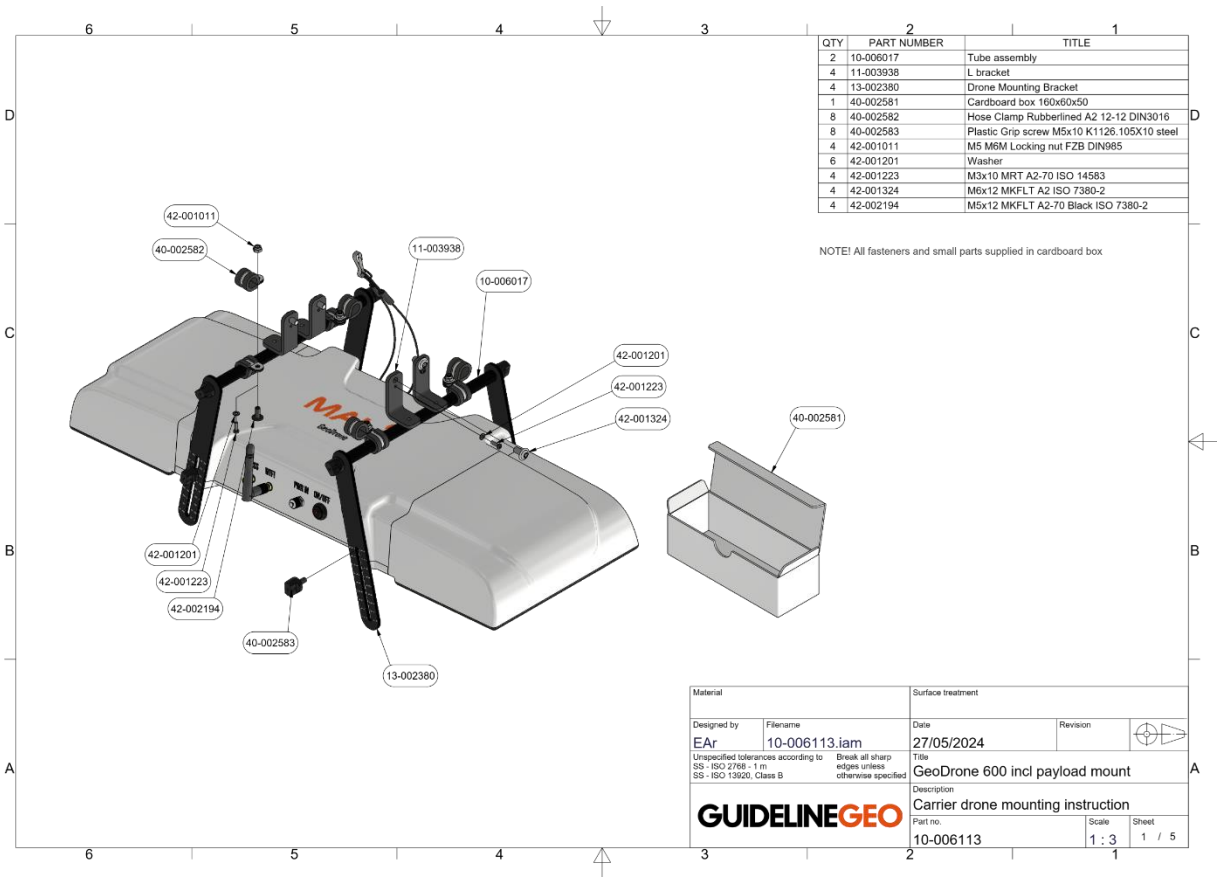
Restoring missing traces

During remote operation (when the GeoDrone 600 antenna is out of Wi-Fi reach of the tablet) or if the Wi-Fi is disrupted when working locally, the in-built memory card in the GeoDrone 600 unit will store the GPR data, thus enabling the measurement to continue. To stop the measurement correctly and ensure data synchronization, the GeoDrone 600 unit must come back into the Wi-Fi range of the tablet.

Note: If the tablet or the GeoDrone 600 unit loses power before measurements are properly stopped and data restored, data (up to 100 MB) can be recovered (primarily from the last measured profile) using the data recovery tool in the MALÅ Controller App. For further instructions, see *MALÅ Controller App User Guide.*

Appendix

GD600 Mounting Kit



QTY	PART NUMBER	TITLE
2	10-006017	Tube assembly
4	11-003938	L bracket
4	13-002380	Drone Mounting Bracket
1	40-002581	Cardboard box 160x60x50
8	40-002582	Hose Clamp Rubberlined A2 12-12 DIN3016
8	40-002583	Plastic Grip screw M5x10 K1126.105X10 steel
4	42-001011	M5 M6M Locking nut FZB DIN985
6	42-001201	Washer
4	42-001223	M3x10 MRT A2-70 ISO 14583
4	42-001324	M6x12 MKFLT A2 ISO 7380-2
4	42-002194	M5x12 MKFLT A2-70 Black ISO 7380-2

NOTE! All fasteners and small parts supplied in cardboard box

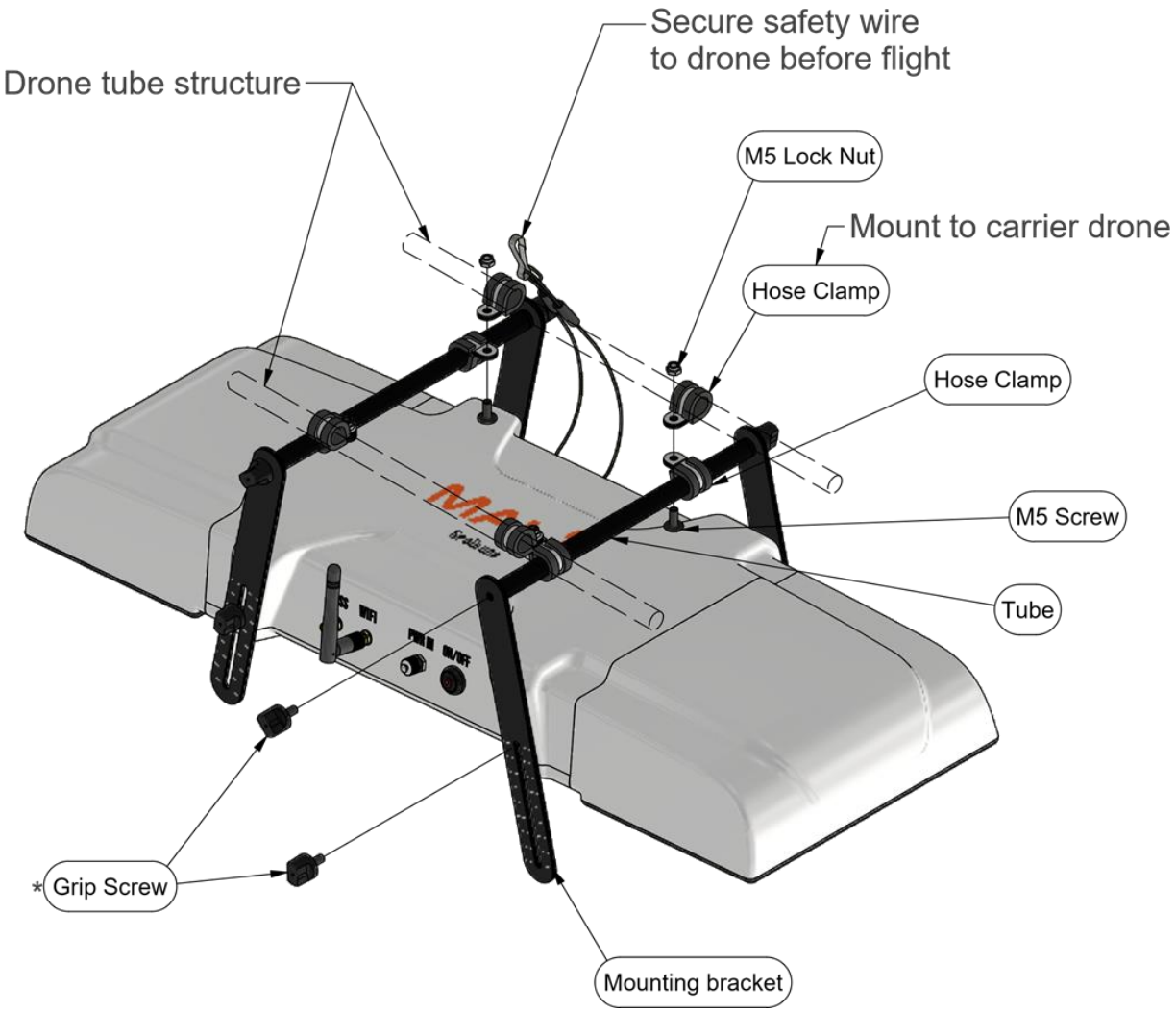
Material		Surface treatment	
Designed by: EAr	Filename: 10-006113.iam	Date: 27/05/2024	Revision
Unspecified tolerances according to SS - ISO 2768 - 1 m SS - ISO 13920, Class B	Break all sharp edges unless otherwise specified	Title: GeoDrone 600 incl payload mount	
GUIDELINEGEO		Description: Carrier drone mounting instruction	
		Part no.: 10-006113	Scale: 1 : 3 / Sheet: 1 / 5

Carrier Drone Mounting Assembly

Drone with tube structure mounting e.g. DJI 600M or IF1200

Mount the GeoDrone 600 under the carrier drone.

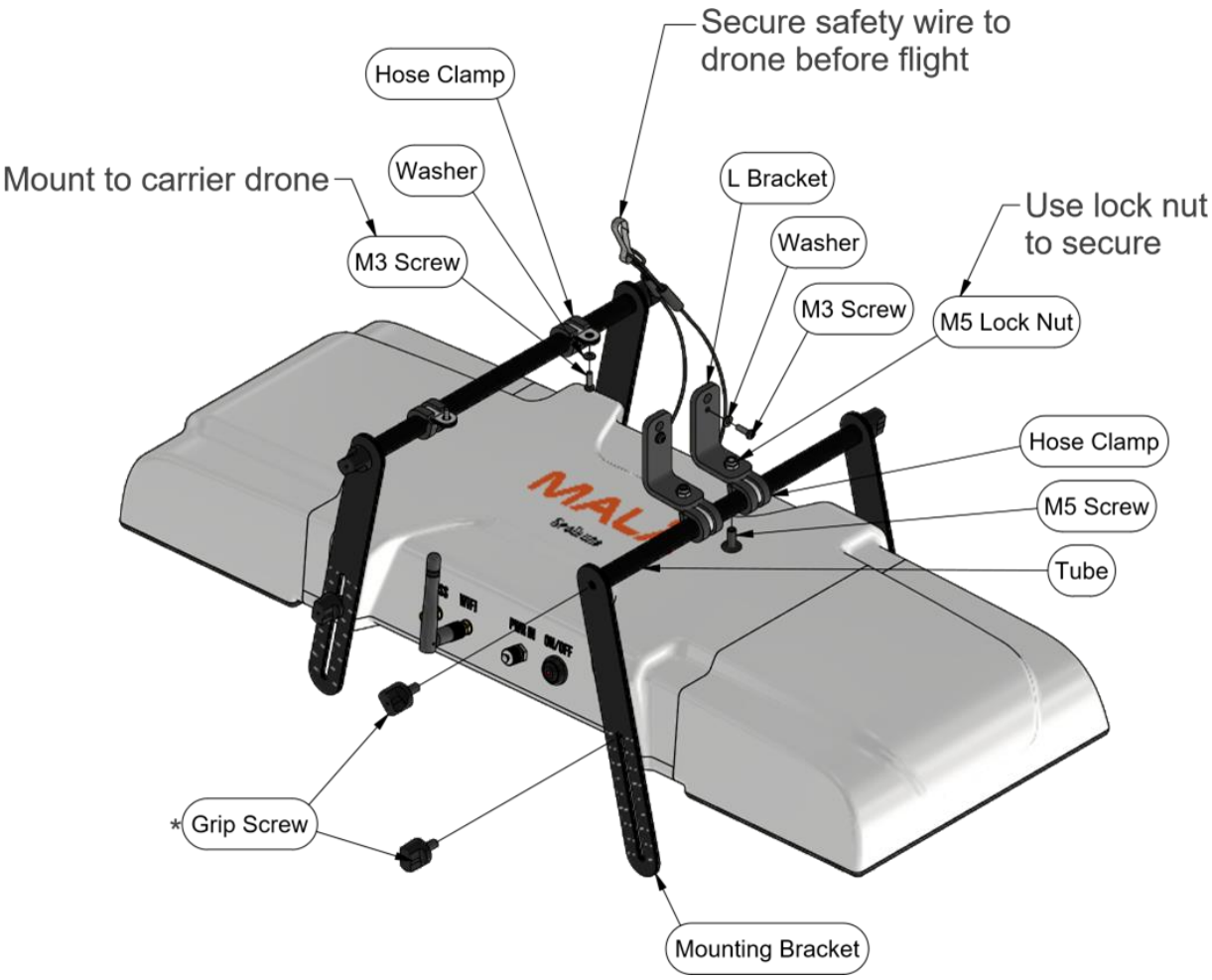
Tighten the grip screw (*) firmly before flight.



Drone with threaded fixing mounting e.g. DJI M300 and M350

Mount the GeoDrone 600 under / front of carrier drone.

Tighten the grip screw (*) firmly before flight.



Drone with threaded fixings on legs e.g. EFT E series

Mount the GeoDrone 600 under carrier drone.

Tighten the grip screw, 40-002583 (*) firmly before flight.