



MALÅ GeoDrone 600
User Guide



Our Thanks...

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

Whether this is your first MALÅ product, or addition to the MALÅ collection, we believe that 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 welcome comments concerning the use and experience with our products, as well as the contents and usefulness of this manual.

Guideline Geo team



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Preface

About this Manual

This manual is written for the end user of the product and explains how to set up and configure the product, as well as providing 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 on <https://www.guidelinegeo.com/contact/>



Safety and Compliance User Notices

This GPR-device is certified according to FCC, subpart 15, 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.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: —Reorient or relocate the receiving antenna. —Increase the separation between the equipment and receiver. —Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. —Consult the dealer or an experienced radio/TV technician for help

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 and US 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 and FCC 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 et FCC 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

Great care should be taken when unpacking the equipment. Be sure to verify the contents shown on the packing list and inspect the equipment and accessories for any loose parts or other damage.

Note: The packing list that is 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 in the event that any damage occurred during shipping.

File any claim for shipping damage with the carrier immediately after discovery of the damage and before the equipment is put into use. Any claims for missing equipment or parts should be filed with Guideline Geo within fourteen (14) business days from the receipt of 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 box that is large enough to allow at least 80 mm of shock absorbing material to be placed all around the instrument. This includes 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, which all helps to optimize the utilization of the equipment and realize the maximum return on your investment.

To register your equipment, simply 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 not possible. MALÅ GeoDrone 600 makes it possible to effectively collect GPR data in a variety of environments, such as snow-covered ground, rocky and uneven terrain, across rivers, lakes and in 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 either 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, as well as 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. To prevent unauthorized modifications, the antenna is securely fastened to the connector with adhesive. For assistance or service related to the antenna, please contact 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 both operators and bystanders, as well as 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 properly connected.

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



Connection for 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, but make sure to attach it securely on top of the drone with e.g. double-sided tape.

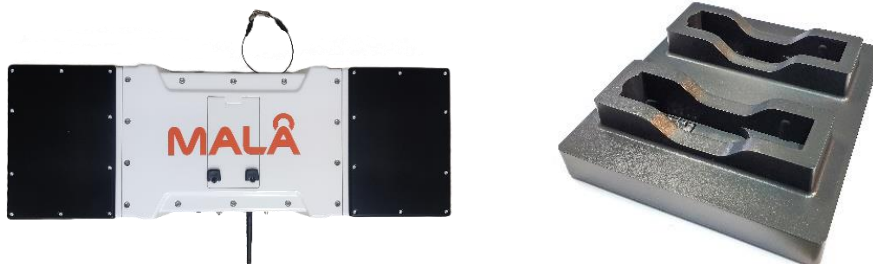
Power

The MALÅ GeoDrone 600 is powered by a single battery. This is found under the hatch on the main 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, simply press the power button and follow the standard startup procedure outlined in this guide.

The Power In connector, marked PWR IN, is used to power the unit using an external power source. The accepted voltage using this input is 12-24VDC. Open-ended power cables are available to be adapted by users as an accessory. If an external power source is used, the internal battery is not needed. Please contact 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

Make sure the battery is charged, and the hatch of the battery compartment properly closed.

Attach the MALÅ GeoDrone 600 to your drone.

Note: Make sure to attach the safety wire to a secure mounting point on the drone.

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

A complimentary payload mounting kit is available for easy attachment to common drone models. Please contact Guideline Geo or your local representative for information on the mounting kit as well as information on Extended Warranty if needed.

Connect the included GNSS antenna. Attach the GNSS antenna on 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 smooth and carefully to not harm the equipment.

Data acquisition

Data acquisition is carried out with the MALÅ Controller App installed on a Samsung Galaxy Active Pro 5G tablet. For more information regarding connection, settings, measurements, data recovery and data 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 is recommended whenever possible.
- As the GeoDrone antenna is airborne, there will be air reflections 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 a route planning software. This software must enable flights of less than 1 m above ground surface. Some standard route planning tools from the drone manufacturers doesn'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, make the turns outside the investigation area, to avoid artefacts in the data used for interpretation.
- Slowing and speeding up of the drone will most likely make the antenna unlevelled/tilting. The GeoDrone 600 can be mounted a bit tilting 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. For mapping point objects and layers the measurements can be made in any direction, broadside perpendicular or broadside parallel. See examples below.



Use a 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 and thus enabling the measurement to continue. To stop the measurement, in a correct way and ensure data synchronization, the GeoDrone 600 unit must come back into 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*.