MALÅ Controller App

User guide

Our Thanks...

Thank you for choosing Guideline Geo and MALÅ! The very core of our philosophy is to provide our users with great products, support, and services. Our team is committed to providing you with the most efficient and easy-to-use solutions with the capability to meet your needs for efficiency and productivity.

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.

Please let us know about your use and experience of our products as well as the contents and usefulness of this manual. We're excited to be part of your journey!

Guideline Geo AB
www. guidelinegeo.com

MALÅ

Table of contents

Items needed

- A compatible Android handheld device. Please contact your Guideline Geo representative for more information on recommended units.
- An App-Enabled antenna. Contact **support@guidelinegeo.com** with your antenna serial number for information on compatibility or required upgrade.
- The MALÅ Controller App package: **Scan the QR code for download**
- A power bank can be good to have to extend the survey time of the recommended tablet.

APP-ENABLED

Installation

Install MALÅ Controller App

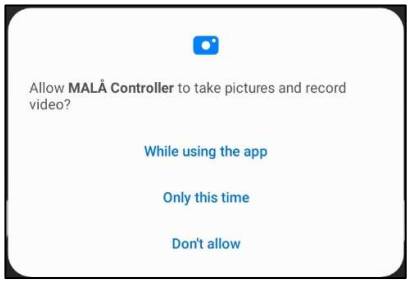
Copy the installation file (APK) to your mobile device storage and install the app.

Note: If installation fails, please uninstall any previous versions of MALÅ Controller App and try again.

Note: If you receive a security warning for unknown apps, enter SETTINGS and allow installation from this source.

When opening the MALÅ Controller App for the first time allow the app to access:

- Location
- Photos, media and files
- To record video, take photos and record sound.



Set up a mobile hotspot

To set up the mobile hotspot (for communication between a MALÅ Wi-Fi enabled antenna and the mobile device), you will need the serial number (s/n 8 digits) from the MALÅ antenna to be used.

This is found on a label, at the rear right corner (for EL Core) or close to the battery (for GX antennas).

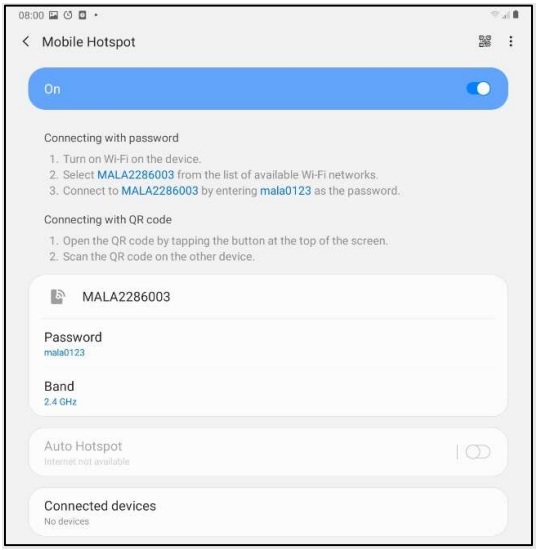
Settings for Android 10

On your mobile device, enter Settings -> Connections -> Mobile Hotspot or Tethering

Change the network name (SSID) to **MALAxxxxxxxx**, where xxxxxxxx will be replaced with *all 8 digits* from the antenna serial number.

Change the password for the mobile hotspot to **mala0123**.

Finally, enable the mobile hotspot to allow this specific antenna to connect to your mobile device.

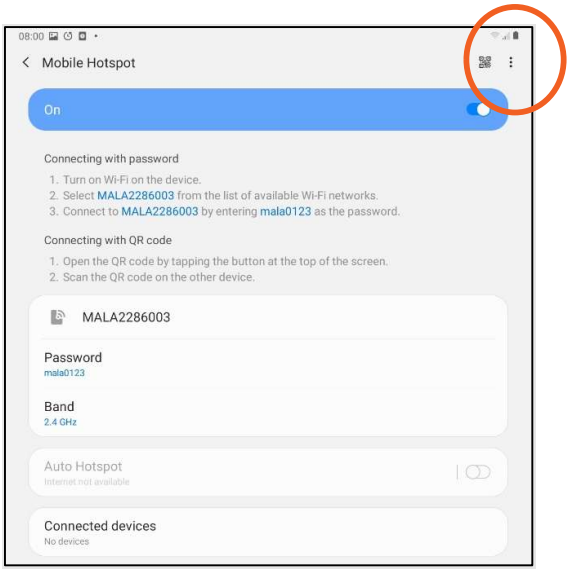


Change the Mobile hotspot timeout settings to *Never timeout*, to avoid corrupting the measurements, due to mobile hotspot deactivation by the android system.

To change this settings enter the Mobile hotspot settings (three dots, upper right corner) and then Timeout settings.

You can change the settings for Wi-Fi sharing in the Mobile Hotspot screen as well. Choose the three dots and then *Wi-Fi sharing*.

Enable sharing to have both Wi-Fi and Mobile hotspot running at the same time. If this is not available, use a Bluetooth pairing to another mobile device to enable data sharing.



Note: For some mobile devices without Internet connection, a sim card needs to be inserted. A dummy card may be used.

Note: If you are experiencing connectivity issues while measuring you can disable Wi-Fi on your mobile device, and only keep the mobile hotspot active (for communication between the MALÅ Controller App and the GPR antenna). This will minimize the risk for connectivity issues.

Settings for Android 11

On your mobile device, enter Settings -> Connections -> Mobile Hotspot or Tethering

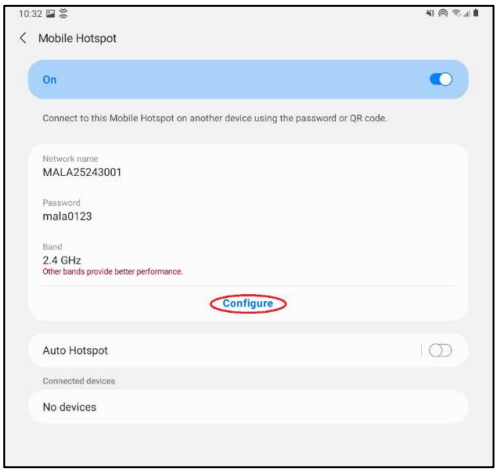
Press Configure.

Change the network name (SSID) to **MALAxxxxxxxx**, where xxxxxxxx will be replaced with *all 8 digits* from the antenna serial number.

Change the password for the mobile hotspot to **mala0123**.

Press *Advanced*.

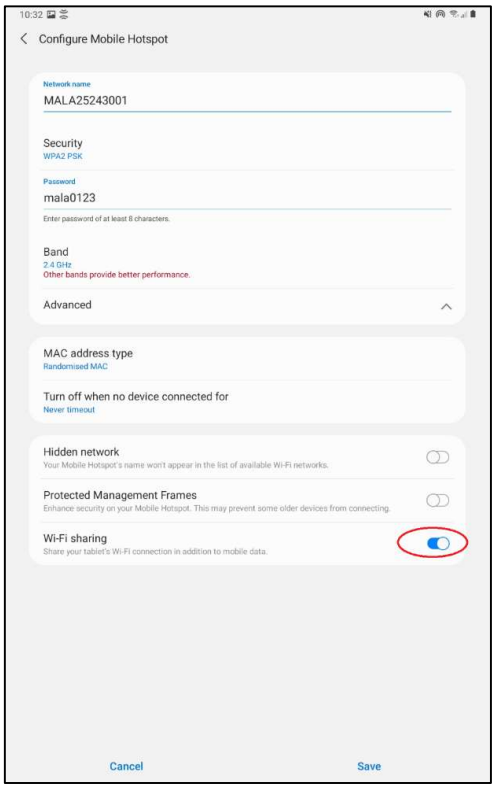
Now you can change the settings for Wi-Fi sharing. Enable sharing to have both Wi-Fi and Mobile hotspot running at the same time. If this



is not available, use a Bluetooth pairing to another mobile device to enable data sharing.

Also change the Mobile hotspot timeout settings to *Never timeout* to avoid corrupting the measurements, due to mobile hotspot deactivation by the android system.

Finally, enable the mobile hotspot to allow this specific antenna to connect to your mobile device.



Note: For some mobile devices without Internet connection, a sim card needs to be inserted. A dummy card may be used.

Note: If you are experiencing connectivity issues while measuring you can disable Wi-Fi on your mobile device, and only keep the mobile hotspot active (for communication between the MALÅ Controller App and the GPR antenna). This will minimize the risk for connectivity issues.

Wireless connection

To communicate between the GPR antenna and MALÅ Controller App, Wi-Fi (mobile hotspot) is used. When communication is working, the antenna model is displayed to the left in the status bar in MALÅ Controller App together with battery and positioning status.

Successful connection between MALÅ Controller App and antenna:

No connection between MALÅ Controller App and antenna:

It is important to have a stable mobile hotspot connection between the mobile device and GPR antenna for effortless data collection. The MALÅ Controller App has advanced features to minimize the impact of difficult Wi-Fi conditions while you measure such as automatic sync to recover data during interruptions.

Unstable Wi-Fi connections are typically caused by wireless interference. This can occur in apartment complexes or other dense areas, where several Wi-Fi networks are active nearby.

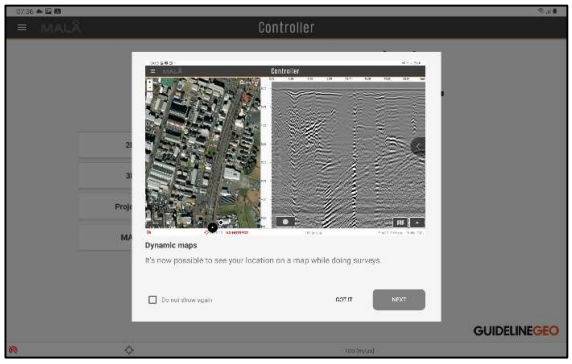
If you have issues with the wireless connection, please follow the troubles shooting guide in Chapter *Troubleshoot and Maintenance.*

Start a project and Main Menu

When starting the MALÅ Controller App, a new feature tour is provided to show the added functions in the latest version.

The feature tour can also be restarted from the About menu.

When pressing GOT IT, the tour finishes and the Start page is opened.

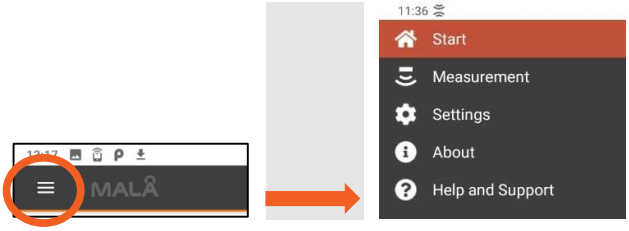


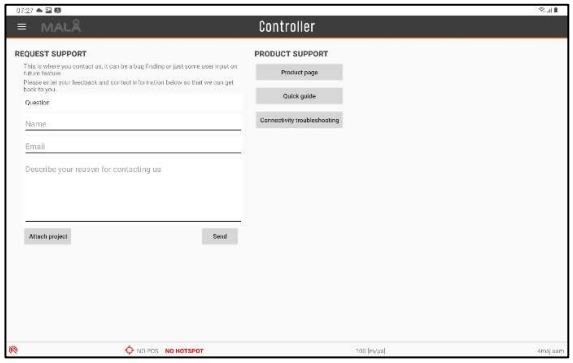
On the start page you have the option to:

- start a new *2D project* (single profiles).
- start a new *3D project* (grid measurements).
- enter the *Project manager* to open and continue or delete already created projects.
- export or open data in *MALÅ Vision.*

The Main menu ☰ is found in the upper left corner. Here you can navigate between:

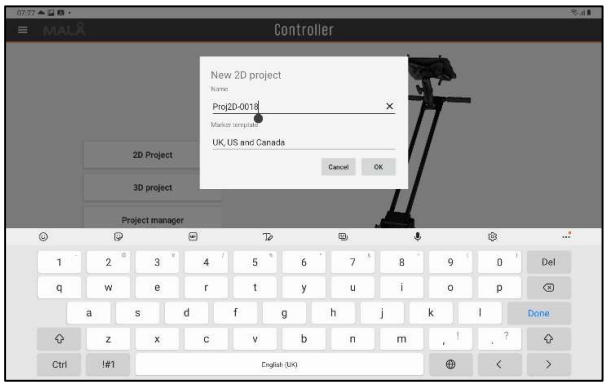
- *Start page.*
- *Measurement page.*
- *Settings page* (measurement settings as depth, trace interval, trigger type, GNSS etc.)
- *About* page, giving information on the connected antenna and the app itself as well as a tour of new features.
- *Help and Support* where you can contact and upload data (*Attach project*) directly to our support team. Here you also find links to product support as user guides.





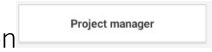
GUIDELINEGEO

When choosing *New Project* (2D or 3D) you have the possibility to change the name or keep the automatically assigned name.



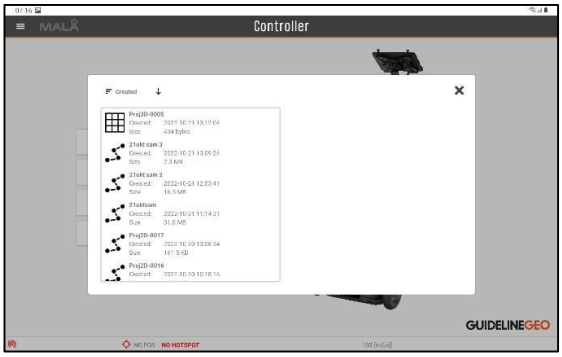
You can also choose between two marker templates for utilities, one for UK/US/Canada and one for Australia.

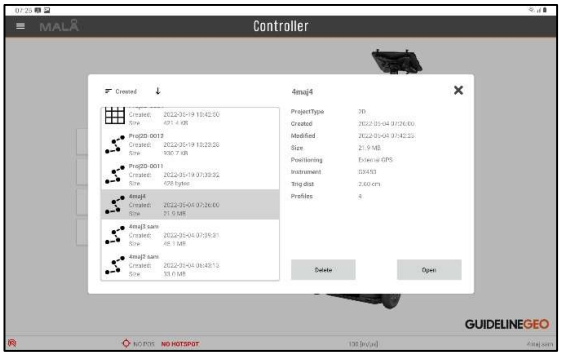
When done, the app opens the Measurement page. See Chapter *Measurements*.

If you select the *Project manager* icon 

, you can open and continue or delete previously made projects. The list of projects can be sorted by creation date, date of modification, name, size or number of profiles. This list can further be sorted as increasing or decreasing.

When a project is selected the project information is displayed on the right-hand side and you have the possibility to open or delete the same.





On the bottom status bar of the app, the following information is displayed:

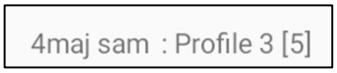
When the hotspot is disabled, a red icon indicates no connection with the antenna and the text **NO HOTSPOT** is shown.

If hotspot is enabled but the antenna is turned off or not yet connected, only the red antenna icon (on the left) is seen.

When contact is made with the antenna (this can take approx. 90 sec), a black antenna icon is shown with information regarding the connected antenna (the name and battery status).

Note: If using an EL Core, two battery indicators are seen, one for each battery in the antenna.

The name of the current project and the profile number for the last recorded profile (if any) is also shown in the bottom bar. The total number of profiles in the current project is shown within the brackets [ ].



You can toggle between measured profiles in the project by tapping once on the project name (bottom right). This opens a Select Profile pop up where you can choose the profile to be opened. When tapping on the profile name (bottom right corner) you see the present profile info and you can delete that single profile.

The positioning symbols, in the bottom bar, represents:

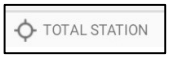
If no Bluetooth device (as GNSS or Total Station) is connected, the No Bluetooth device symbol is displayed.

User selected Positioning mode None (i.e., no positioning used).

Positioning device has no fix acquired.

GNSS device has fix quality but not RTK (Normal, DGPS, Float RTK).

GNSS device has fix quality RTK.



Total Station is used and connected.

Measurement settings

Select *Settings* in the Main Menu  . Here the following can be adjusted:

Measurement

- Numbers of Samples to set the investigation depth. If the vertical scale is set to *Depth*, the estimated investigation depth will show as well. If the vertical scale is set to *Time*; the number of ns (nano seconds) will be displayed.
- Distance, Time or Manual triggering. Distance triggering uses the encoder wheel to give a fixed distance between traces, e.g. 5 cm. With time triggering the traces are collected at a time defined spacing, e.g. 0,1 sec. With manual triggering you decide when to take a measurement by clicking the data collection button in the measurement view of the MALÅ Controller App. One click will trigger the collection of one radar trace. This is, for example, useful when you want to measure with an uneven distance between your traces.
- Encoder type and Manage wheels (add, recalibrate, reset and delete wheels).
- Trace interval, in cm or sec.
- Automatic or manual zero level setting. If selecting manual, please set the number of samples for the zero level.
- Sound for AI markers. If ON a beeping sound will be heard when AI markers are appearing. See also section *MALÅ AI*.

Positioning

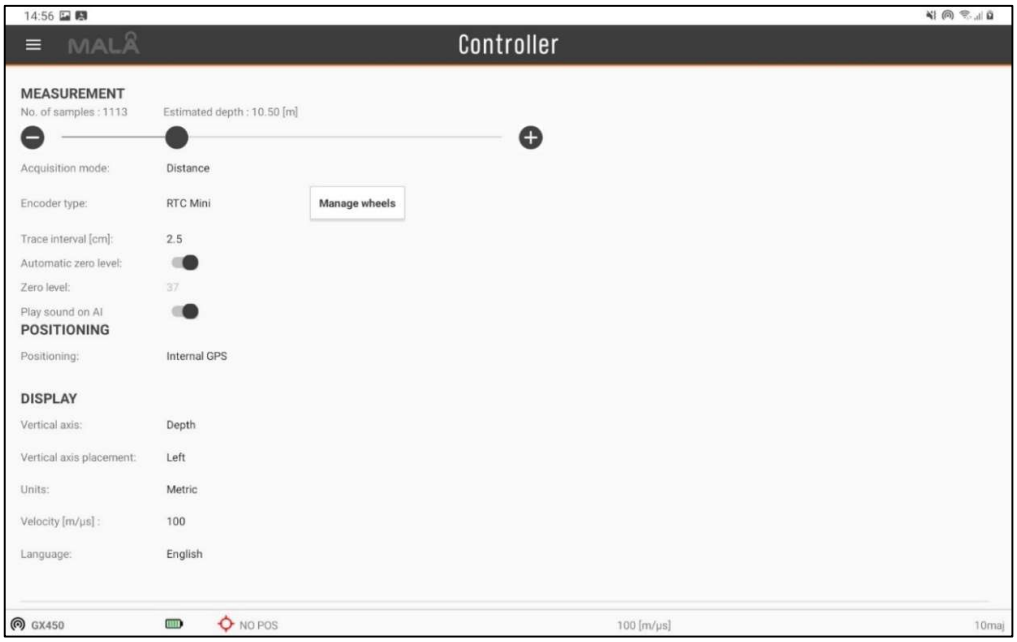
- Positioning (see section *Positioning* below).

Display

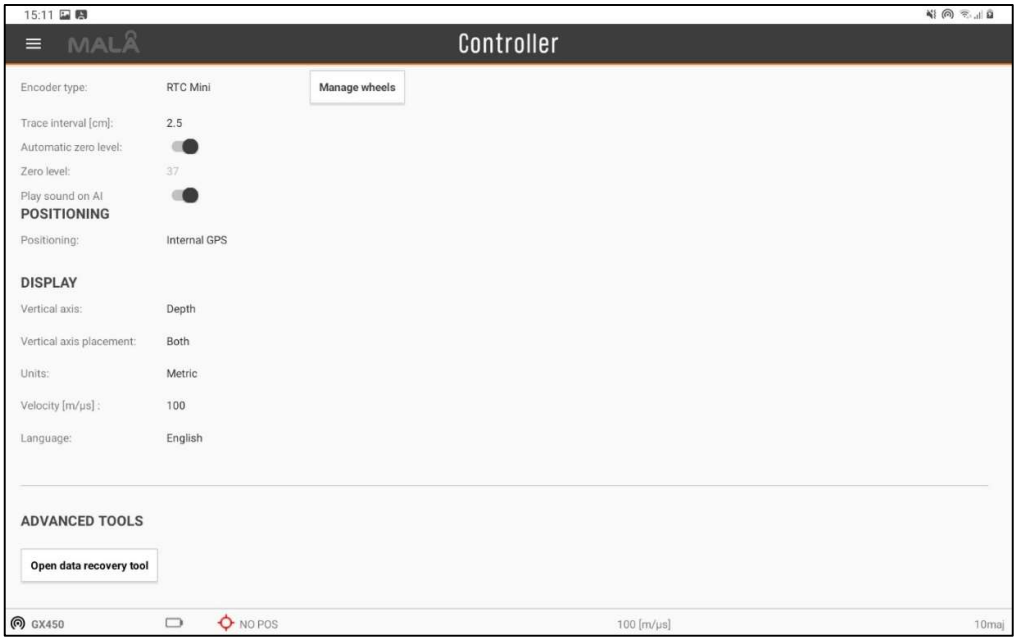
- Vertical scale: Time or Distance.
- Vertical axis placement: Choose between left, right or both.
- Measurement Units: Meters or Feet.
- Language: English, French, German, Spanish and Chinese. You need to restart the app when changing language.

Advanced

This menu is found by scrolling down and is used for Data recovery (see section *Data recovery* below).



Measurement setting screen 1



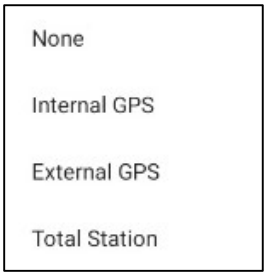
Measurement setting screen 2

Note: The settings are automatically saved and if the application is restarted, the same settings will be used.

Positioning

In the Measurement settings you will also find the options for collection of positioning data:

- *None*: No positioning data is collected.
- *Internal GPS*: Positioning data is collected from internal GNSS in the antenna and data stored in a cor-file.
- External GPS: Positioning data is collected from an external GNSS with Bluetooth connection and data stored in a cor-file. When choosing External GPS, you will get a pop-up window with the available, paired GNSS antennas. See section *Positioning with external GNSS.*
- *Total Station:* Positioning data is collected from a Total Station with Bluetooth connection and data stored in a corc-file. See section *Positioning with Total Station.*



Note: When measuring a 3D project, the MALÅ Controller App creates temporary coordinates for relative positioning of the measured profiles in the grid, if no GNSS is in use. The grid will have the start coordinates as 0/0 and the local coordinate output will be stored in the corc-file.

Positioning with external GNSS

The output from the external GNSS should be in NMEA0183 and with an output frequency (output rate) of at least 5Hz (one point every 0.2 sec). The positioning with an external GNSS can be carried out in two ways:

External GNSS with RTK-correction by base station.

Note: It is very important to set-up the base in a proper way to achieve a good positioning result. For more information visit for instance https://docs.emlid.com/reachrs/ppk-quickstart/placing-the-base.

External GNSS with mobile RTK-correction.

If an external GNSS with mobile RTK-correction is used, carry out the following steps to connect between the MALÅ Controller App and the GNSS:

1) Use a mobile phone (with 4G/5G) and set up a hotspot to share internet with your GNSS antenna. Then the correction for the RTK-GNSS can be carried out through your mobile phone´s internet connection.
2) Connect/pair your mobile device (tablet, with MALÅ Controller App installed) by Bluetooth to your GNSS antenna.
3) Set up a hotspot on your mobile device (tablet, with MALÅ Controller App installed), as explained in Chapter *Installation*, to connect the GPR antenna with your mobile device.
4) When starting MALÅ Controller App, choose External GPS and select the GNSS antenna to connect.

Note: Depending on the mobile device and mobile phone used, it is good to make sure that any unnecessary connections as Wi-Fi and Bluetooth are turned off.

Positioning with Total Station

The output from a Total Station should be in pseudo-GGA and the positioning with Total Station can be made in two different ways:

Total Station

Prism and hand unit on GPR antenna

1) Output of pseudo-GGA through Bluetooth. Connect the tablet with MALÅ Controller App installed to the Total Station hand unit, by Bluetooth. The first time, it is advisable to connect the hand unit to a PC by Bluetooth and verify the output by a terminal emulator (as TeraTerm or Putty). It should only be a pseudo-GGA message transferred.

Total Station

Prism and hand unit with Bluetooth adapter on GPR antenna

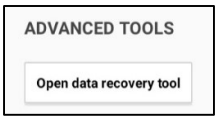
2) Output by serial port on the hand unit. Use a Bluetooth-to-serial adapter and connect the serial cable from the hand unit to this adapter. The Bluetooth adapter is then connected (by Bluetooth) to the tablet with MALÅ Controller App. The following Bluetooth adapter is compatible with MALÅ Controller App: IOGEAR GBC232A. It needs power, which can easily be supplied by battery. Make sure that the hand unit is configured to output pseudo-GGA through serial interface.

Specifications on setting up Total Stations are not covered in this manual, see details from each manufacturer.

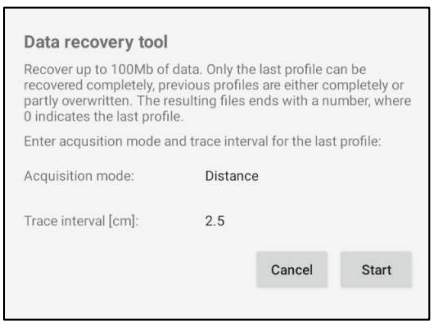
Data recovery

If connection is lost between MALÅ Controller App and the EL Core or GX antenna, data is automatically stored on the antenna. This data is also automatically recovered when contact is established again. For larger amounts of missing traces, the recovery starts when the profile is stopped. If this for any reason fails e.g., due to power loss, the Data Recovery tool in the MALÅ Controller App can be used to recover the data. The latest profile will be fully recovered, whereas older profiles will only be partly recovered. In total 100MB of data can be recovered.

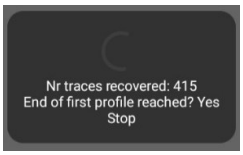
Press *Open data recovery tool* in the Settings menu / Advanced.



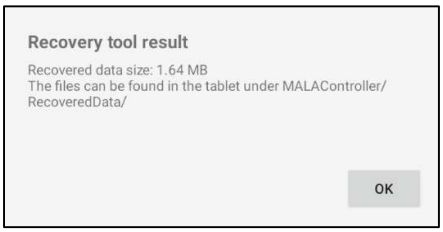
Set the acquisition mode (distance or time) as well as the trace interval you used during the data collection and press *Start* to start the data recovery process.



During the process, progress can be followed.



When the recovery is ready the following screen is displayed:



Note: The data recovery tool can be slow, depending on the file size, so please be patient.

Note: If the file to recover is larger than 100 MB, only the parts up to 100 MB will be recovered.

Measurements

2D measurements

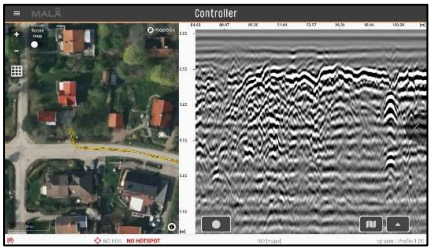
When the measurement settings are set, press  in the Measurement tab to start a new profile.

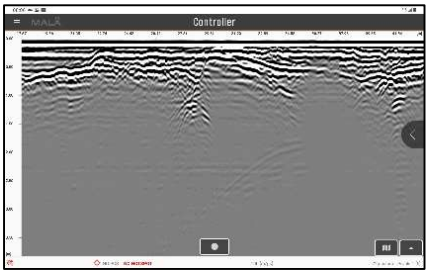
Press  to stop a profile.

Data is automatically stored in the mobile device.

Toggle between the three different views (map+radargram, only radargram or only map) by pressing  .

For the Dynamic Grid feature  see section *Dynamic Grid*.



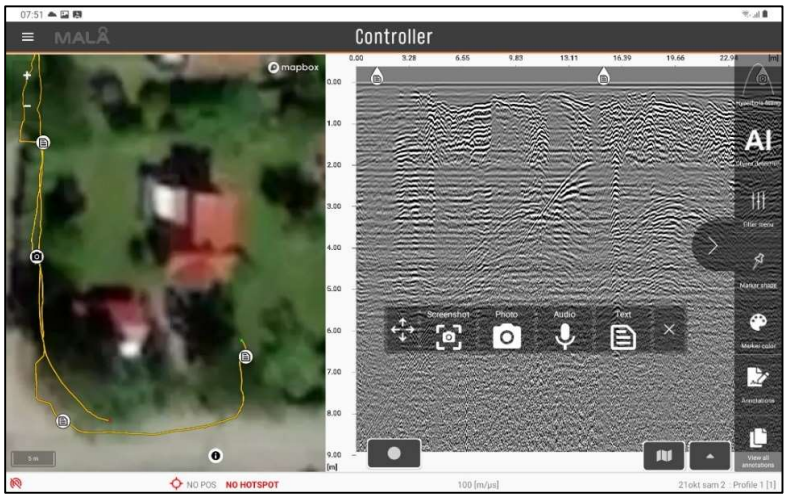


Note: If the red “start profile” dot is grey, there is no connection to the GPR antenna, check the antenna and the hotspot connection.

Note: Previously used measurement settings are saved so if you are satisfied with these, the measurements can be started immediately.

During a measurement you can:

- Use hyperbola fitting to set velocity or change velocity directly.
- Use MALÅ AI to aid in hyperbola identification.
- Apply filters such as background removal, AGC and gain.
- Add object markers anywhere in the radargram by tapping the screen. The object markers can be of different shapes, colors (following the set template) and size.
- Add surface markers (at the location of the antenna)
- Add annotations (screenshots, photos, audio recording and text).

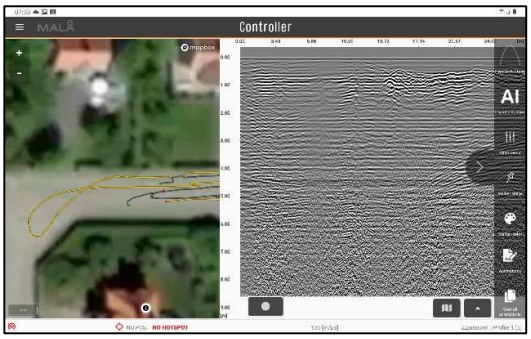


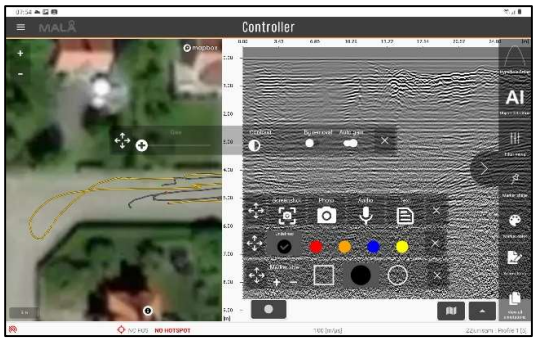
These options can be accessed by opening the slide-out menu  . Slide out or click on the arrow to open and slide in or click to close.

Each dynamic menu in the slide-out menu opens as a floating panel which can be placed anywhere in the MALÅ Controller App window.

Use  to move the panels around and close the panel with  .

The functionality of the floating panels is described in detail below.





Note: You can also toggle between measured profiles in the project by tapping once on the project name (bottom right). This opens a Select Profile pop up where you can choose the profile to be opened.

When tapping on the profile name (bottom right corner) you see the present profile info and you can delete that single profile.

Note: The backtrack function, when going backwards with the measurement wheel, is the same as on any other MALÅ device. The current position of the antenna is indicated by a vertical yellow line.

Note: If the connection between the GPR antenna and the MALÅ Controller App is lost during measurements, the collected data will be buffered in the internal memory of the antenna and retransmitted to the MALÅ Controller App once the connection is re-established.

If the number of missing traces is large, MALÅ Controller App will request all missing traces during a sync function which will be executed after each measurement. This sync function starts automatically when you press Stop profile.

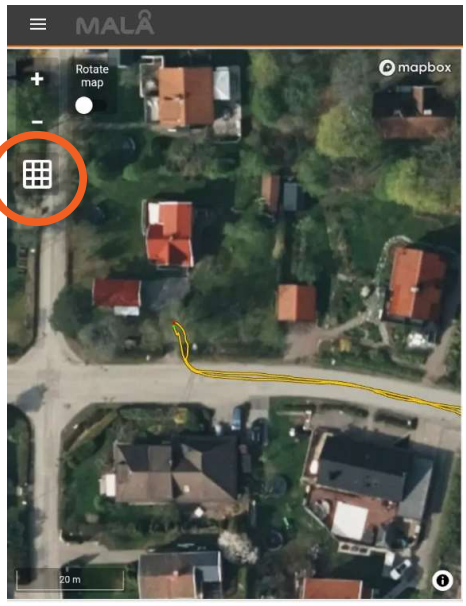
If this sync fails due to e.g. power loss, use the Data Recovery Tool, explained in the section *Measurement Settings*.

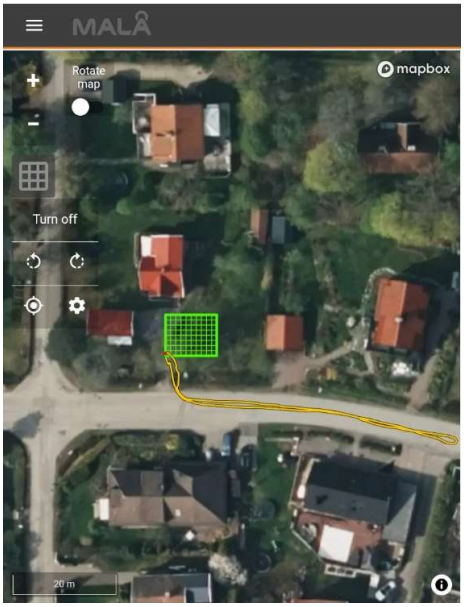
Dynamic grid

The feature Dynamic grid allows you to add a virtual survey grid on top of your background map, so you can simplify the field work by following dense parallel virtual gridlines instead of using tape measures and guidelines.

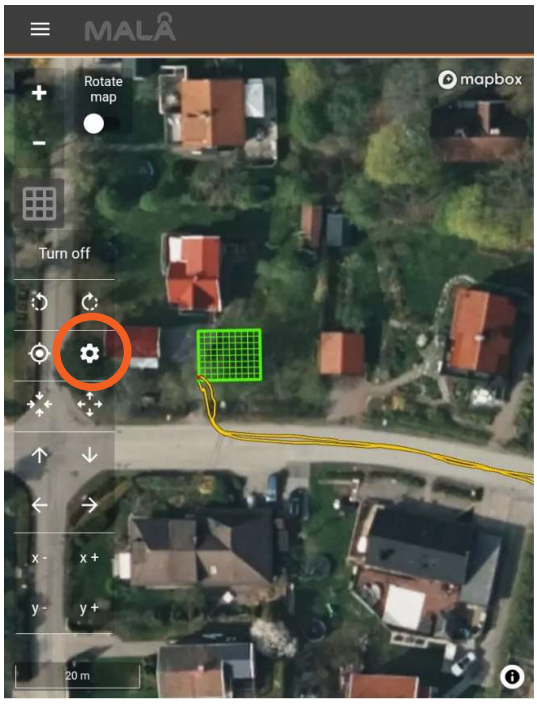
Note! To achieve a good result, the use of Dynamic Grid requires precise positioning, with RTK-GNSS or Total Station positioning.

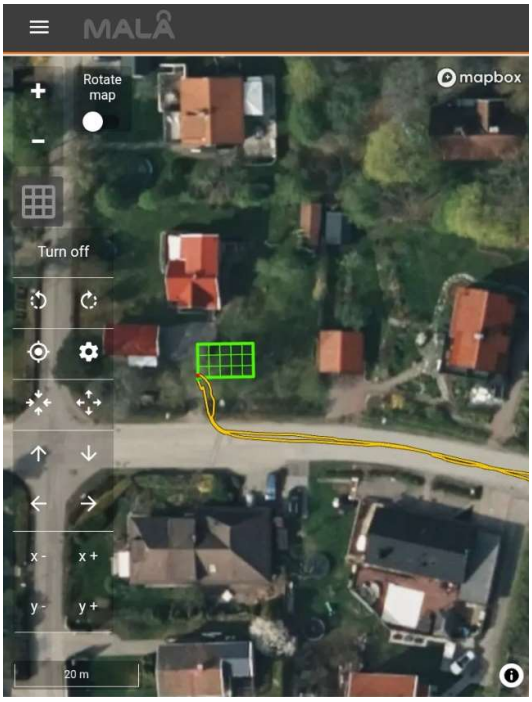
Press on the Grid-icon on the map to create the grid and open the grid settings pop-up. The grid will be displayed in green on the map view. You can easily tilt the grid to left or right with the two turn icons.





To make more adjustments on the grid, press the cogwheel .





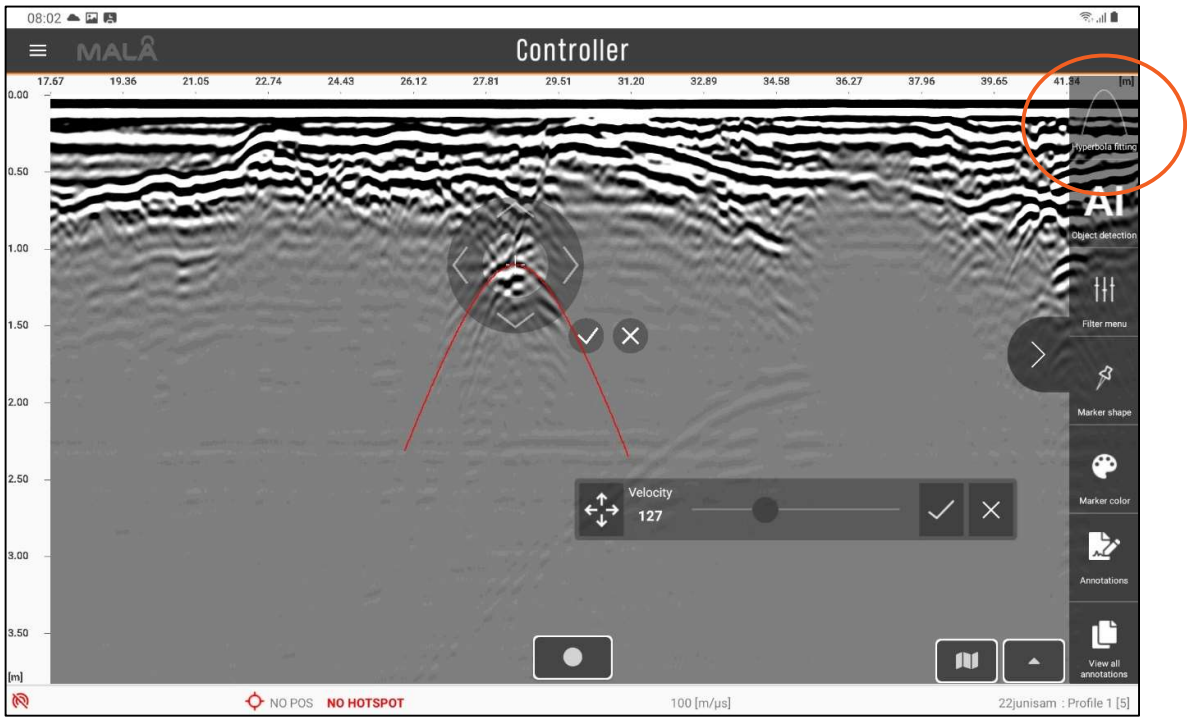
The following settings for the Dynamic grid are available:

- Turn off the Dynamic grid.
- Tilt the grid to left or right.
- Open or close the Dynamic grid settings with the cogwheel.
- Decrease or increase the line spacing. The spacing is shown as a pop-up.
- Move the grid up, down, left or right.
- Decrease or increase the number of lines along the x-axis.
- Decrease or increase the number of lines along the y-axis.

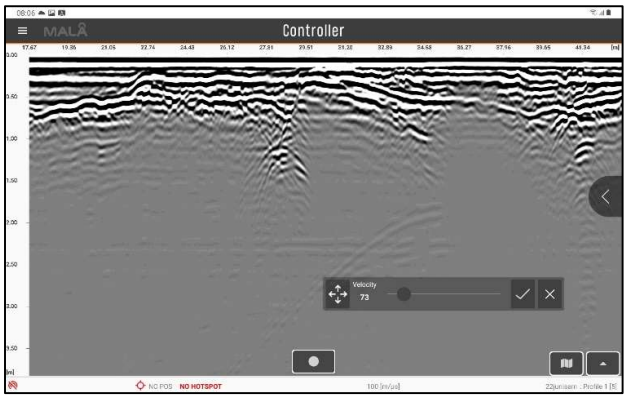
Hyperbola fitting

The global velocity can be set with the hyperbola fitting tool. Press Hyperbola fitting and place the hyperbola tool on top of your measured hyperbola. Fine adjustment of the location can be done with the arrows.

Change the velocity (and by that the shape of the hyperbola) using the slider.

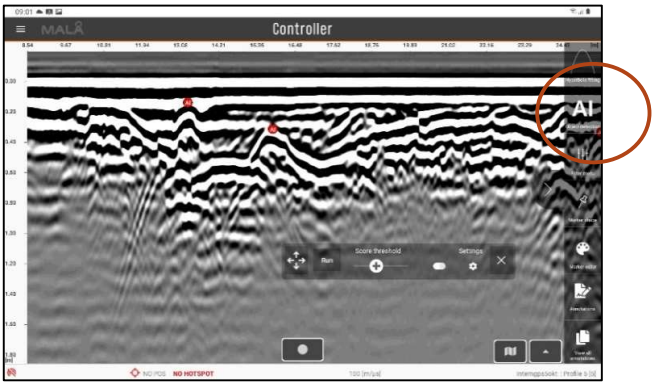


During the measurement the selected velocity is visible in the status bar (below the radargram) and can also be changed directly. By pressing the velocity, a velocity slider appears for easy velocity adjustment.



MALÅ AI

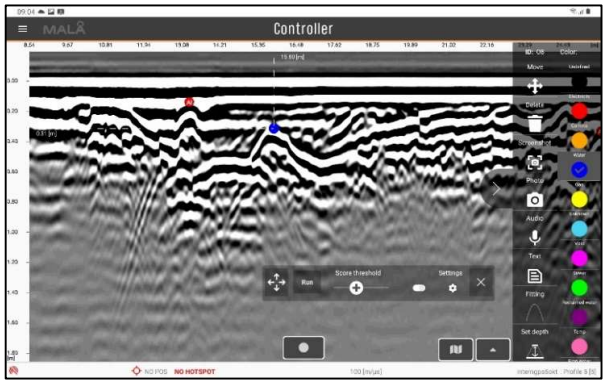
With MALÅ AI you get real-time assistance in identifying and marking hyperbolas in your data.



Activate the option in the *AI Object detection* floating panel and adjust the sensitivity using the score threshold slider.

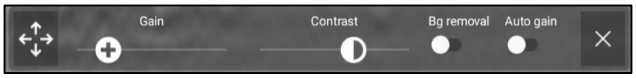
In the settings menu ⚙, the search depth can be adjusted.

The AI markers are easily turned into object markers. Click on the AI marker and choose the wanted color on the right-hand side of the screen.



Filters

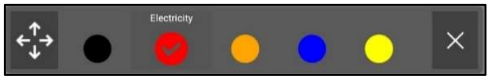
In the filters panel you can adjust gain and contrast and apply background removal or auto gain.



Use the slider to increase or decrease the contrast or gain. The gain slider is disabled if auto gain is turned ON.

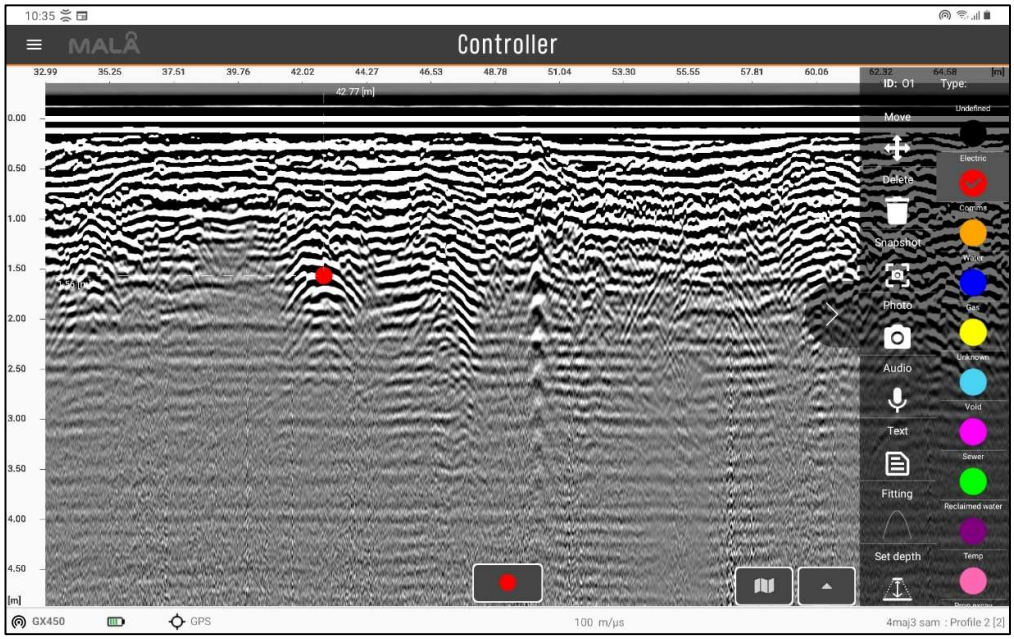
Marker type and colors

In the *Marker type/size* and *Marker colors* panels the type and color of marker can be set. The colors are based on a template, found in the measurement settings menu.

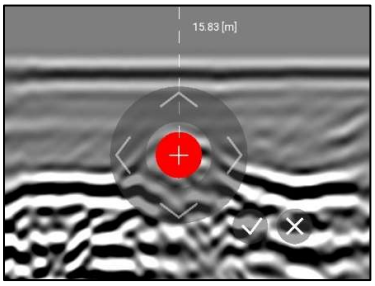


The set marker can be edited with a short press on the marker. In a slide out menu you see the marker ID and you can:

- Move the marker
- Delete the marker
- Take a Screenshot
- Take a Photo
- Record Audio
- Write a text annotation
- Carry out hyperbola fitting
- Set depth of the marker



Options for marker edit. With a short press on the marker the slide out menu will appear.



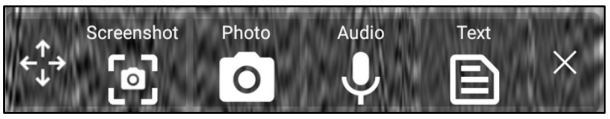
With the option Move, use the arrows for precise positioning or drag.

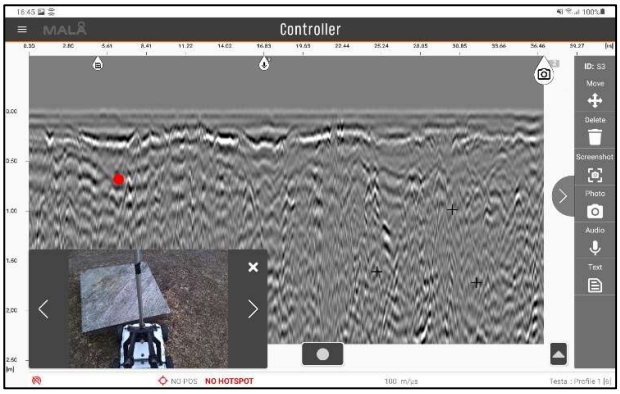
Annotations

In the annotation menu you can add screenshots, photos, audio recordings and text and tie them to specific markers in your profile. The annotation is placed at the last measured trace if you are in active measurement mode.

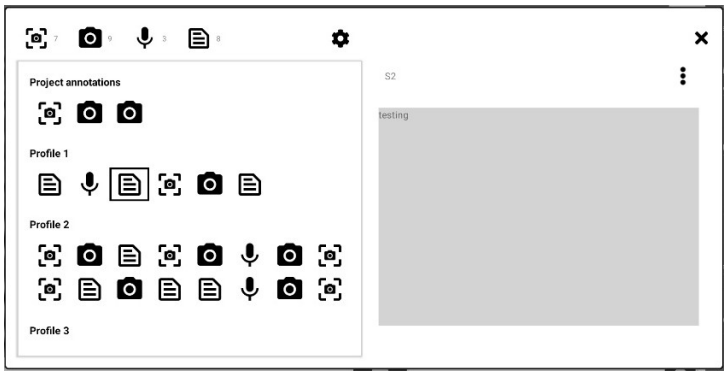
In the example to the right a photo annotation has been added and a preview of the collected photo is shown.

If you have stopped a profile and added an annotation it will be linked to the project instead of to a profile.





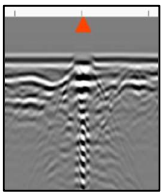
With the option *View all annotations* you see an overview of the added annotations for the project and for each profile. When clicking the annotation, it will open in the right-hand window.



The annotations viewer can be sorted in different ways, and this can be controlled by tapping the settings wheel in the top middle part of the window. You can also sort the annotations by type. Simply click one (or several) of the annotation type icons in the top left row to view the selected type/s.

Surface marker

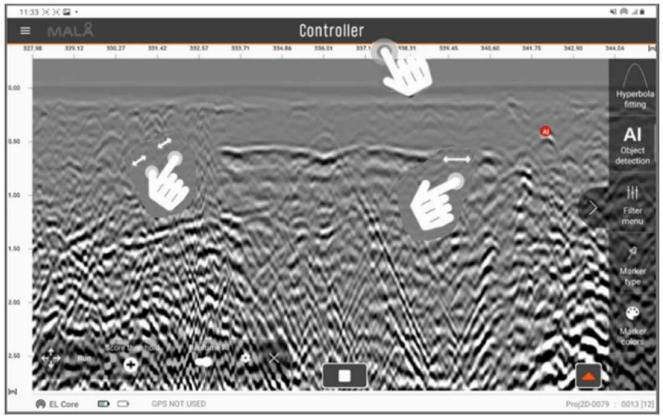
The option Surface marker places a marker on the surface at the last measured trace.



With a short press on the marker, a slide out menu appears where you can add text, photo, screenshot and audio annotations to the marker. You can also move or delete the surface marker.

Pan, zoom and stretch

During measurement you also have the possibility to pan, zoom and stretch the data.



Pan Press one finger and move to pan in the profile left/right/up/down

Zoom Pinch and use two fingertips tip to zoom in and out in the data. The data will be zoomed proportionally for x and y.

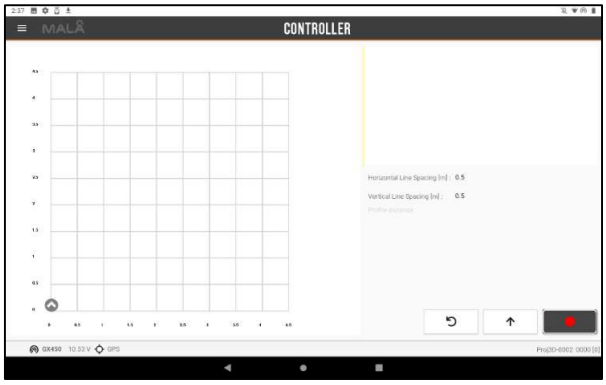
Stretch Use two fingertips to zoom either vertically (down or up) or horizontally (left or right).

The set zoom will remain during your measurements.

To go back to the standard settings (normal aspect ratio), double-click either of the x- or y-axis.

3D Measurements

The 3D project is a good aid when working, e.g. without any GNSS positioning, in a local grid. The project is started by defining the desired horizontal and vertical line spacing between your profiles in the grid.



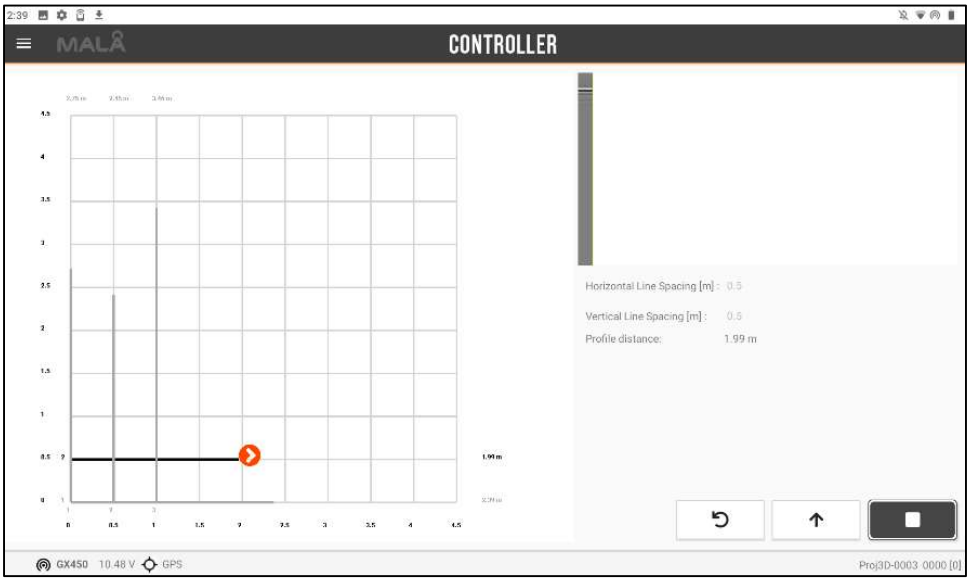
Measure as many lines (in any length) as you wish. Data can be collected in both X and Y or either X or Y direction, but data collection needs to start from either the southern or western baseline for each profile.

When data collection is started, the radargram is displayed in the upper right corner and the profile is indicated with darker grey in the grid on the left side. The length of the profiles is also viewed on the grid. See picture below.

Each line is started and stopped by  and  . You can zoom in and out in the radargram view during measurement.

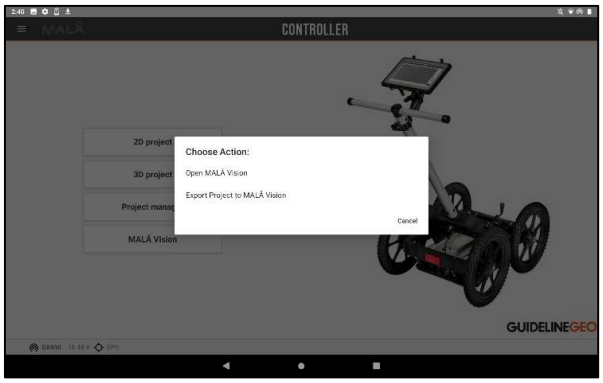
If you need to undo the last line, press  . Change profile direction data with  and  .

Note: The grid is only a visualization and will not change if profiles are made longer. The profile length is seen above or on the right-hand side of the current profile, as well as underneath the radargram view.



Upload and data transfer

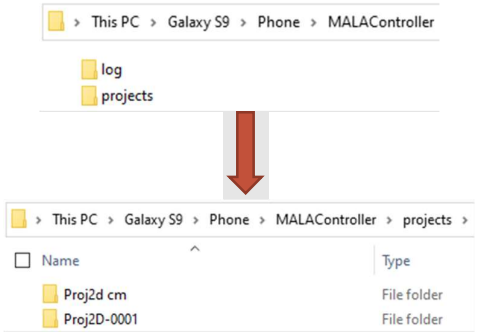
Export of data to MALÅ Vision is seamless and simple. Make sure your mobile device is connected to the Internet. This can be done by direct connection for the mobile device (Wi-Fi or 3G/4G) or sharing Internet to the mobile device from, for example, a mobile phone.



Simply press the MALÅ Vision button on the Main screen and choose if you want to Open or Export data.

Select the project to be uploaded.

Data can also be transferred by connecting the mobile device directly to a computer or by using the built-in sharing functionality in your Android device or through a third-party service such as Dropbox or OneDrive.



The MALÅ Controller App creates a MALA Controller folder, and in this folder, all created projects can be found.

The following data files are created:

- .rd7-files (raw data)
- .rad-files (header file)
- .mrkj-files (marker file with support for templates)
- .cor and .corc-files (positioning) .corc-files are created for 3D Grid projects collected without GNSS (or when collecting data with a total station) and can be opened and viewed in MALÅ Vision. There is currently no support for .corc-files in the MALÅ Object Mapper software.

Troubleshoot connectivity issues

Below is a troubleshooting guide for connectivity issues. Always check our website; guidelinegeo.com for the latest news and updates. If you can't find a solution to your connectivity issues, we recommend you to please contact Guideline Geo support (support@guidelinegeo.com) or your closest Guideline Geo sales representative. You can also contact support directly by going to the Help and Support page of the main menu. Add your name, your email, a description of your issues and, if you wish, your data and click send. Guideline Geo support will contact you as soon as possible in order to resolve your issue.

If you can't connect to the antenna at all, make sure you follow the workflow described in this trouble shooting workflow. *Make sure everything is configured exactly as described.*

1. Ideally set up your system in an *area with minimal Wi-Fi interference* to reduce potential problems.
2. Make sure that there are *no other hotspots* with the same network names (SSID) running on another mobile device in the vicinity. Do this by disabling the hotspot and by searching for Wi-Fi networks. Make sure there are no other Wi-Fi networks with the same SSID as you have set up.
3. Disable Wi-Fi on your mobile device and then turn off and turn on the hotspot again.
4. Make sure you're using the *correct SSID* for the hotspot (MALAxxxxxxxx). The xxxxxxxx indicate the serial number of your GPR antenna. Also check the password, which should be *mala0123.*
5. Make sure that the antenna *batteries are charged*. For Easy Locator Core, the indicator on the batteries should have at least two bars. The LED may be on even though there is not enough battery power to initiate connection to MALÅ Controller App.
6. If that doesn't work, *restart the MALÅ Controller App* on your mobile device and wait for at least 30 seconds. This is done by "Close all" or swipe off the app in the Recent view (button with three lines or a square).
7. Restart the tablet and then open *MALÅ Controller App* again.
8. Easy Locator Core specific: If you still cannot get connection, or if you for some reason would lose connection to the antenna, press the *ON/OFF* button on the antenna 5 times within 5 seconds. This will reinitialize the antenna and reset the connection. Please note that this reactivation process may take up to 2 minutes to complete.
9. If that doesn't work press and *hold the ON/OFF button* to turn the antenna off completely, then power it on again.