# AGIS Software

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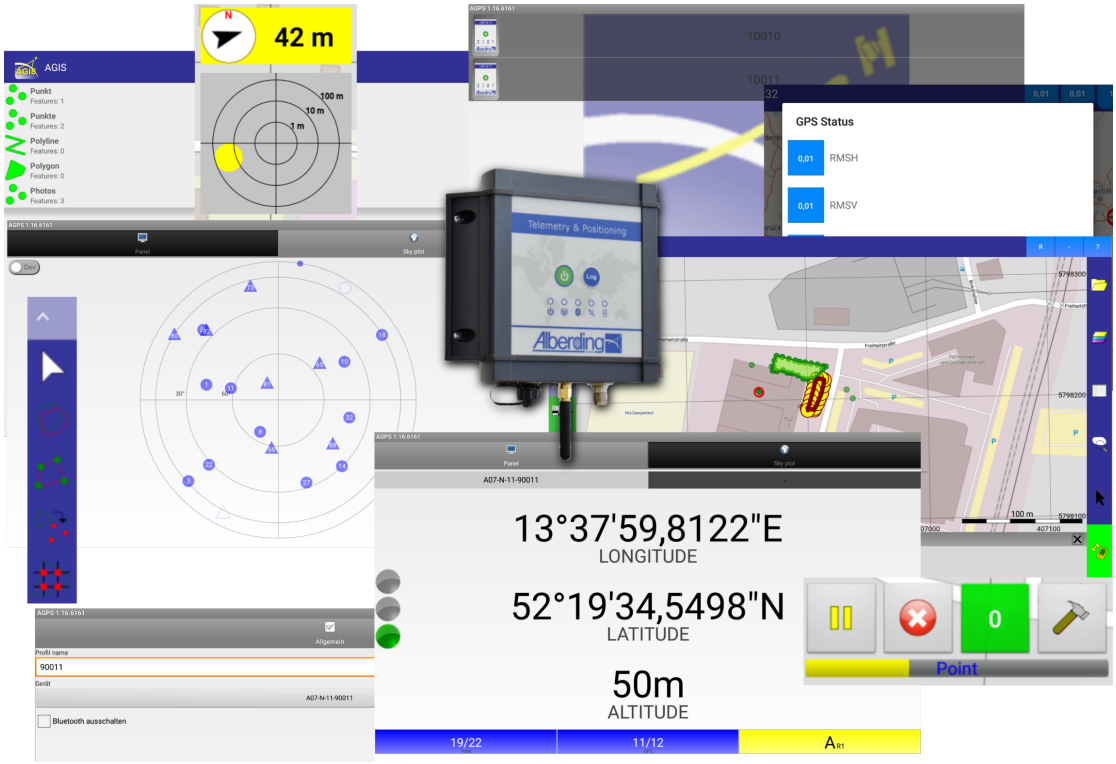


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**Revision History**

| Version | Date | Description of the changes |
|---|---|---|
| 1.0 | 31.08.2016 | First release |
| 1.1 | 12.09.2016 | Revision of all chapters |
| 1.2 | 29.11.2016 | Revision of all chapters |
| 1.3 | 09.06.2017 | Addition of chapter 3, revision of chapters 3 and 5.2.5 |
| 1.4 | 15.01.2018 | Revision of all chapters |
| 1.5 | 03.04.2018 | Addition of chapter 5.3, revision of chapters 5.1 and 5.2.7 |
| 1.6 | 30.05.2018 | Revision of chapters 3 and 5 |
| 1.7 | 10.10.2019 | Revision of all chapters and translation to English |

**Software versions**

| Software | Version |
|---|---|
| AGIS | 1.19.7171 |
| AGPS | 1.19.7059 |

# Contents

# 1 Introduction

The *AGPS* and *AGIS* Software of Alberding GmbH are applications for the acquisition of geodata. Both of these applications are available for Android operating system and can be installed on a tablet or smartphone.

The *AGPS* application serves as an interface between the GNSS receiver (*Alberding A07-RTK* (see Fig. 1)) and the *AGIS* software. Individual profiles can be created for different tasks. The Alberding *A07-RTK* is connected to the external Android device via Bluetooth. The information of the transmitted NMEA messages is displayed thematically. This includes the visualisation of the tracked satellites (*GPS* and *GLONASS*) on a *sky plot* and the GNSS position quality data (e.g. *RTK fixing status, estimated position accuracy, satellite geometry*).

The *AGIS* application is a mobile GIS solution for the acquisition and maintenance of data with different GPS/GNSS accuracy levels. In addition to the project management structure, the *AGIS* application offers a variety of functions. This includes recording vector data in the form of points, lines and polygons, navigation and editing of individual elements. Using the integrated camera of the Android device users can take georeferenced photos. For the field data management in a desktop GIS application, shapefiles are stored in ESRI standard format for each project.


**Figure 1:** Alberding A07-RTK

# 2 Functions of the basic and full versions

The *AGIS* software can be purchased as a basic or full version. The *AGIS* functions of the versions are listed below.

| AGIS functions | Basic version | Full version |
|---|---|---|
| Open project | X | X |
| Open background project | | X |
| New project | X | X |
| Add Layer | | X |
| Enable GPS | X | X |
| GNSS cursor auto pan | | X |
| GPS skyplot | | X |
| Set pole height | | X |
| Record point | X | X |
| Record points | | X |
| Record polyline | X | X |
| Record polygon | X | X |
| Layer | | X |
| Download offline map | | X |
| Base layer (Alberding OSM) | X | X |
| Feature properties | X | X |
| Feature list | | X |
| Overview/Detail | | X |
| Select+ | X | X |
| Delete feature | X | X |
| Edit points | | X |
| Copy feature | | X |
| Create feature | | X |
| Feature -> Points | | X |
| Create raster | | X |
| Scale bar | | X |
| Show grid | | X |
| Show coordinates | | X |
| Navigation | | X |
| AGIS options (Configuration) | | X |
| Info about... | X | X |

# 3 Installation

This chapter guides you through the installation of the *AGIS* and *AGPS* applications. Please read and complete the following steps carefully to avoid installation problems.

### 1. Install AGIS.apk and AGPS.apk

Click on the apk files of the *AGIS* and *AGPS* applications one after the other. The following messages will appear:

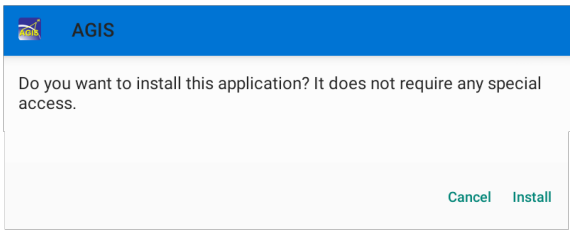



**Figure 2:** Installing the AGIS Application

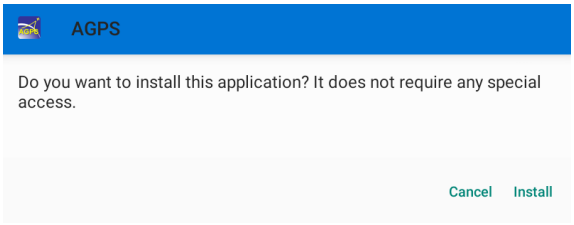



**Figure 3:** Installing the AGPS Application

Press *Install* at the bottom right. Then, the application will ask for permissions to access some capabilities or information on your device (to access photos, media and files on your device, to access the device's location and to make and manage phone calls). If you agree with the permissions of the applications, press *Allow* at the bottom right. For both applications, click *Open* after installation.

### 2. Directory structure

Establish Internet connection and start the *AGPS* application. The application **automatically** creates the following folder structure on the device (tablet, smartphone, etc.):

`/storage/emulated/legacy/eEntwicklung.net/`

or

`/storage/emulated/0/eEntwicklung.net/`

The path section /storage/emulated/0/ or /storage/emulated/legacy/ writes the internal memory of the device. Depending on the Android version, this path section may no longer be displayed in the folder *Documents*.

The *AGPS* folder is automatically created in the *eEntwicklung.net* folder. The *AGPS* folder contains the *Import* folder. The *eLicence.dat* file must be copied into this folder.

`/storage/emulated/legacy/eEntwicklung.net/AGPS/Import/eLicence.dat`

**Then close the AGPS application and copy the eLicence.dat to the "Import" folder (see above). Only then it is possible to activate the license in the AGPS application.**

### 3. License activation

Establish Internet connection and restart the *AGPS* application. The following window opens:


**Figure 4:** AGPS and AGIS activation start screen - Installation

**Note:** If the application has already been opened before, make sure that it or the process has been terminated completely. Open the window showing the processes and either close all processes (*Close all*) or just the one by pressing the corresponding *Close* icon (cross symbol) (see Fig. 5).

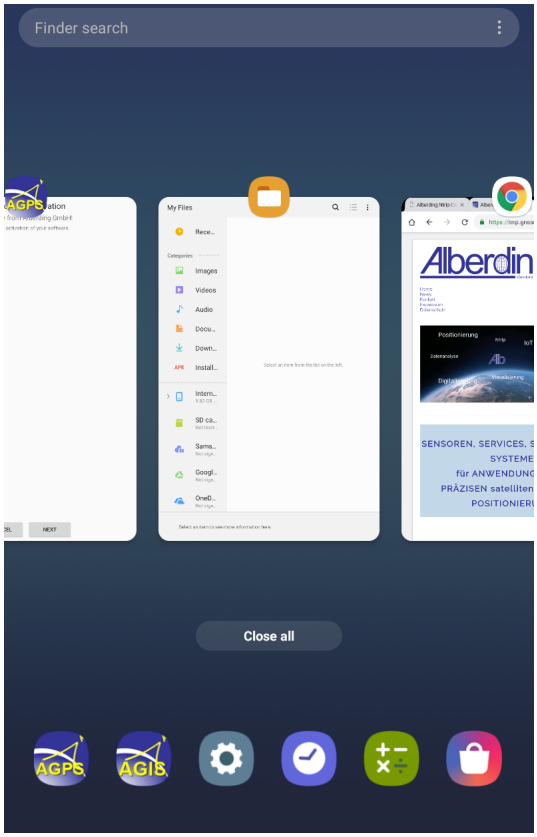



**Figure 5:** Close applications or processes - Installation

To continue the activation, press *Next*. Contact data must be entered in the *Prepare activation* window (see Fig. 6). This data is only required for the activation of the licence.

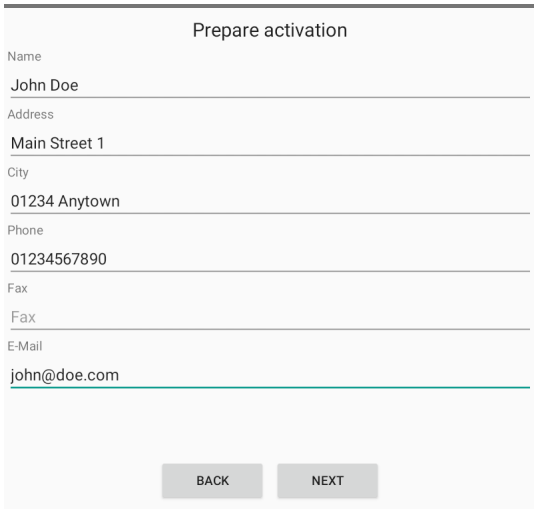



**Figure 6:** Contact information - Installation

After entering the data, press *Next*.

To activate the license, the device (tablet, smartphone, etc.) must be connected to the Internet. The activation codes will then appear in the following window (see Fig. 7).

**Note:** Please do not copy the activation codes from the following image if you do not see them. These codes are only valid once and cannot be used for your activation.

Press *Next* to complete the activation (see Fig. 8).


**Figure 7:** Activation codes - Installation

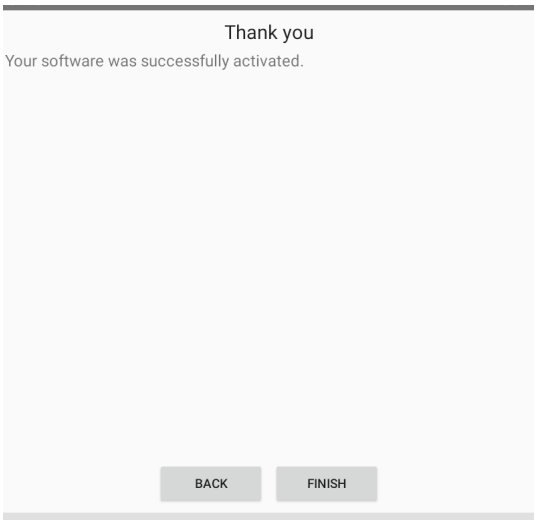



**Figure 8:** Finishing the activation - Installation

**Note:** If it is not possible to connect the device to the Internet, only the 24-digit activation code will appear (see Fig. 9). You must provide this code to Alberding GmbH by e-mail or telephone to receive the activation codes for the two fields below.

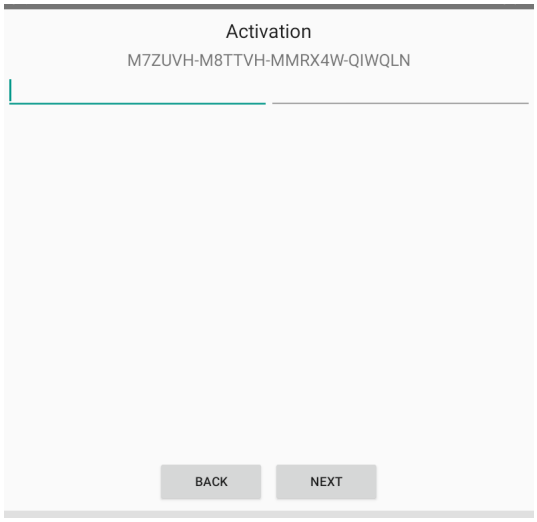



**Figure 9:** Activation without Internet connection - Installation

# 4 AGPS interface

The *AGPS* application controls the connection of the device (e.g. tablet, smartphone) to the *Alberding A07-RTK* GNSS receiver. After opening the application, the following start screen appears (see Fig. 10).

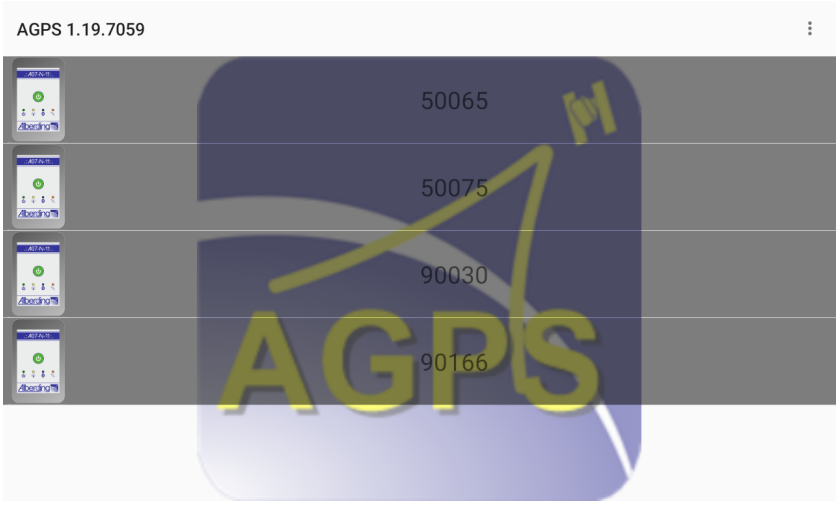



**Figure 10:** Start screen of the AGPS application

If Bluetooth connectivity has not been activated, the application will make an authorisation request (see Fig. 11). Click *Allow* here to connect the two devices.

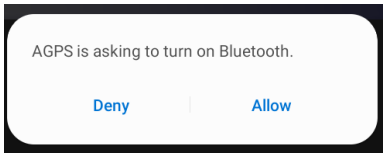



**Figure 11:** Bluetooth authorisation request

There are three vertical dots (overflow menu) at the top right of the start screen. By clicking on it, a more options menu opens with the options *New profile*, *Light/dark mode* and *Photo* (see Fig. 12).

Click *Light/dark mode* to change the background colour of the application. The *Photo* button will switch to the camera mode of the device. The *New profile* option will be explained in the following chapter.

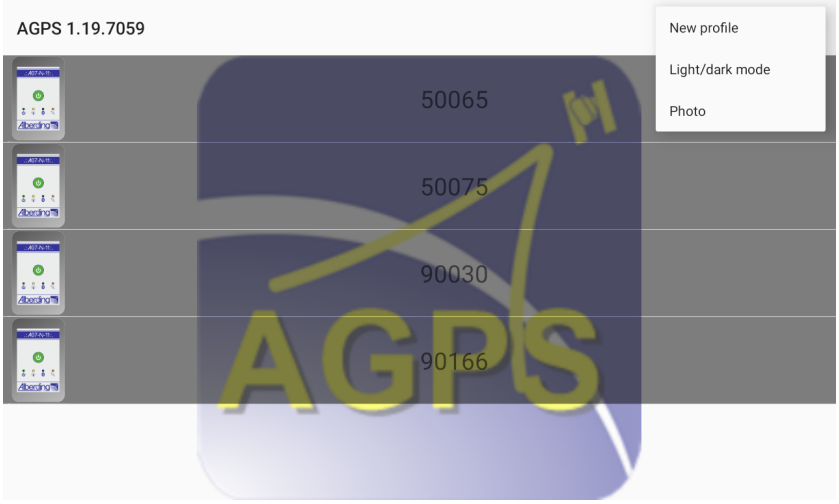



**Figure 12:** Start screen with the more options menu

## 4.1 New profile

When editing projects, it might be useful to create different profiles. Clicking the *New profile* button in the more options menu opens a window to configure the profile (see Fig. 13).

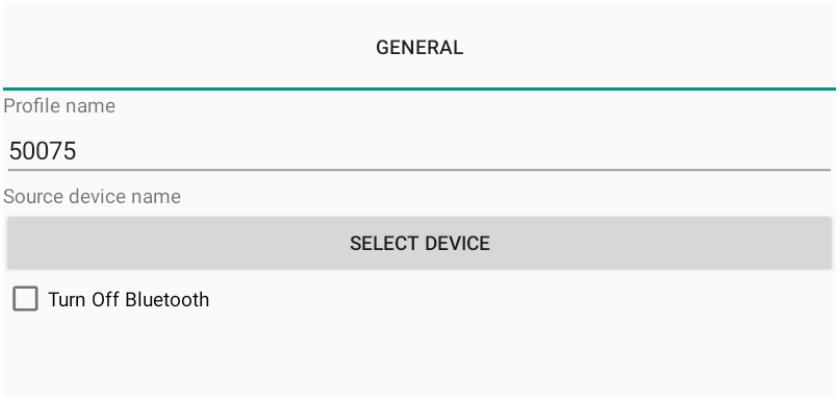



**Figure 13:** General - Create a new profile

A *Profile name* must be assigned in the first line of the *General* page. This can be selected specifically to distinguish between a large number of projects.

Subsequently, a device must be selected or connected. Clicking the *Device* button opens a page showing which devices were previously connected to the hardware (see Fig. 14). Select the device to be connected from the list.

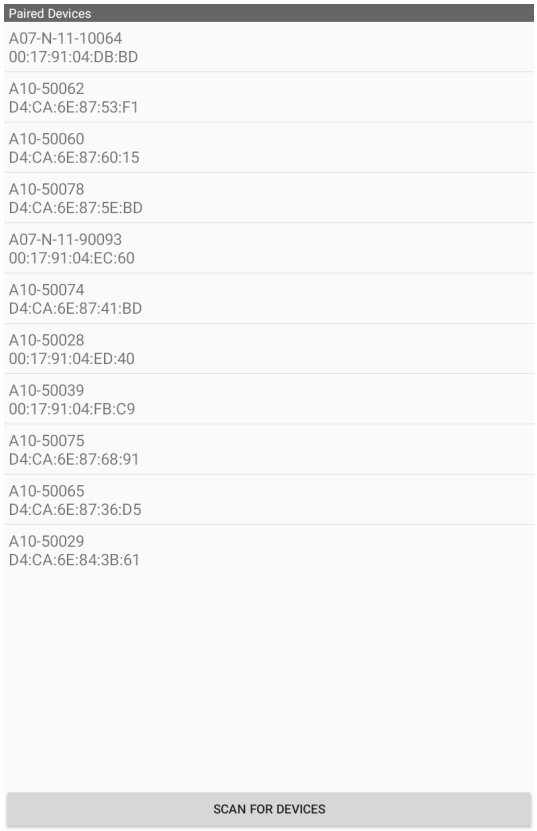



**Figure 14:** Select or connect a device

To connect a new device, press the *Scan for devices* button. All devices nearby that are detected via Bluetooth are displayed. The new device appears at the bottom of the page and can be selected (see Fig. 15).

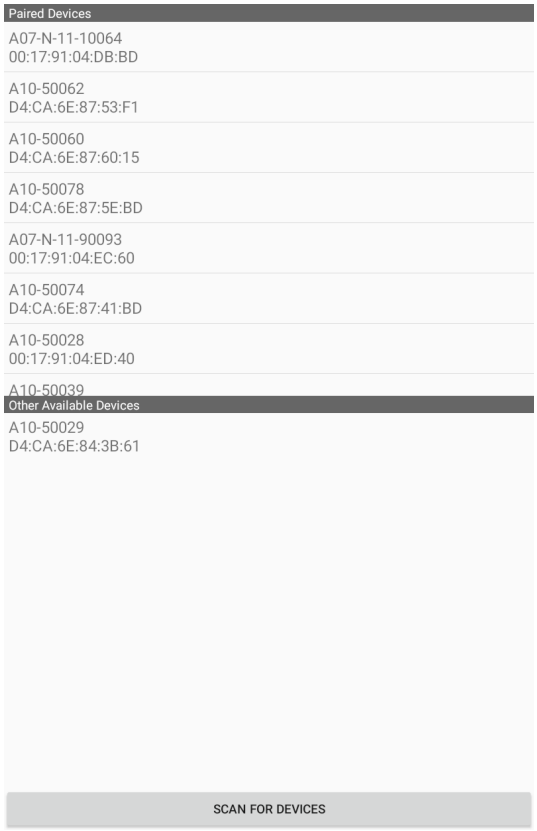



**Figure 15:** GNSS device - Search for device name

Press and hold the *Device* button to open the *Reset* window (see Fig. 16). Clicking the button deletes the connected GNSS receiver. It will still appear in the *Paired devices* list.

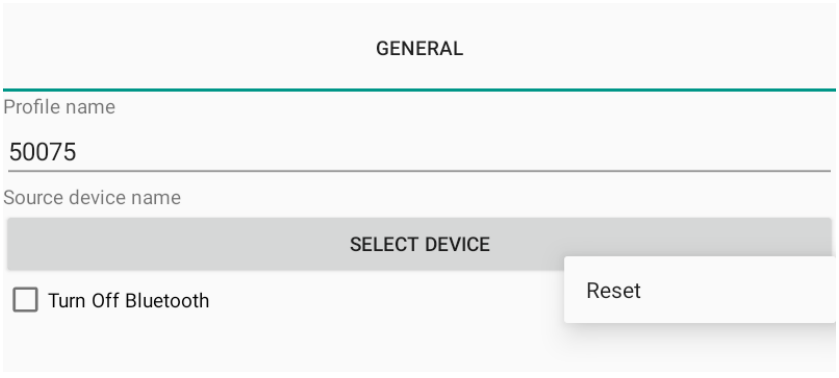



**Figure 16:** Remove the selected GNSS receiver

Once the measurements have been completed, the Bluetooth connection can be deactivated by checking the box *Turn off Bluetooth*. Alternatively, it is also possible to disconnect the Bluetooth connection using the hardware.

To exit the settings, use the hardware *back* button to return to the main menu. To *edit*, *copy* or *delete* profiles, press and hold the profile button until the dialogue for these options opens (see Fig. 17).

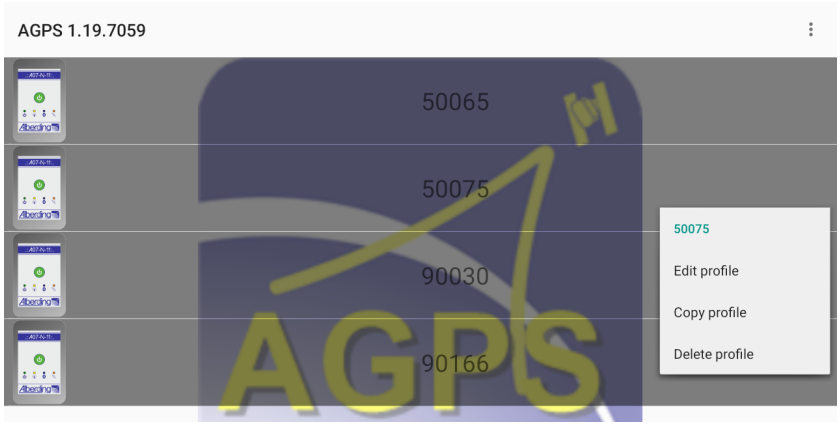



**Figure 17:** Overview - Edit, copy, delete profile

You can click on the profile in the main menu to check the status of the connection to the GNSS receiver (see Fig. 18). The *Panel* tab displays the status of the GNSS receiver in traffic light colours, name of the connected device, coordinates (Longitude, Latitude, Altitude), number of satellites and solution type. As soon as correction data is used, the software displays the data age in addition to the solution type.

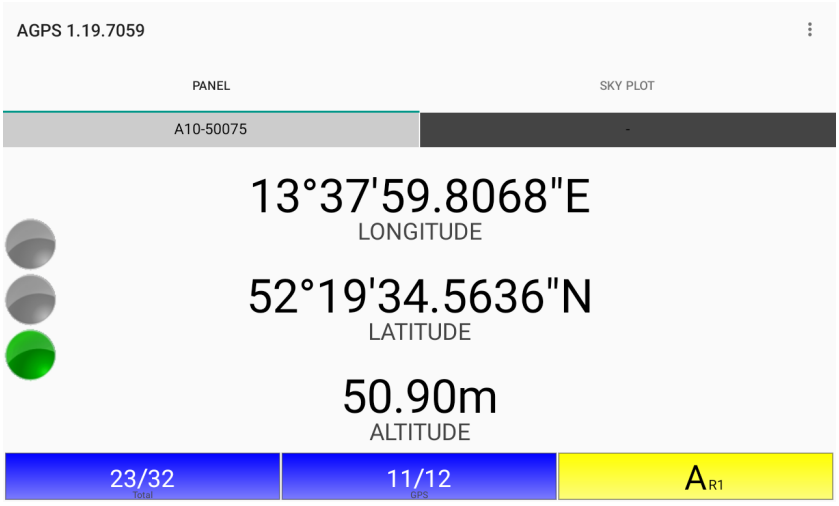



**Figure 18:** Status - Panel

Status of the GNSS receiver (traffic light indicator):

- Red - Disabled
- Yellow - Initialisation
- Green - Connected

Regarding the *number of satellites*, the first number indicates the number of satellites that contribute to the calculation of the position solution and the second number represents the total number of visible satellites. The boxes are coloured and have the following meaning:

- Red - There are no satellites available.
- Yellow - Calculation of a position solution is not possible.
- Green - Calculation of a position solution is possible.
- Blue - Calculation of a position solution is accomplished with correction data.

The third box on the right always contains an **A** (Autonomous (Standalone)), is coloured yellow and when using correction data, one of the following solution types is displayed next to it as a smaller letter:

- D - DGPS
- F - Float
- R - RTK (Fix)

Additionally the data age is displayed in seconds as a small number.

The *Sky plot* tab displays all visible *GPS* and *GLONASS* satellites (see Fig. 19). The **GPS** satellites as a **circle** with the corresponding satellite number and the **GLONASS** satellites as a **triangle** with the corresponding satellite number.

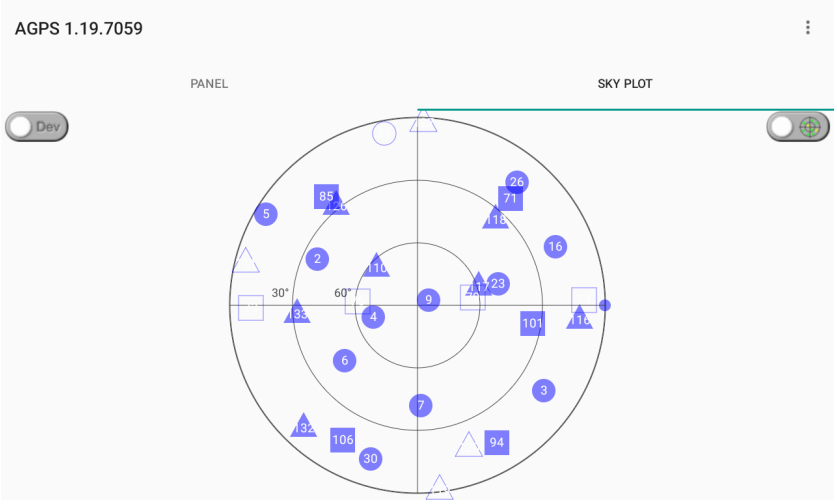



**Figure 19:** Status - Sky plot

In the sky plot, the small dot on the outer edge indicates the north direction. The *Dev/Head* button in the upper left corner can be used to select whether the compass of the hardware (Dev) or the direction determination from the GNSS data (Head) is used. For the latter, it is necessary to be in motion.

If the button at the top right is clicked, the application displays the status summary (see Fig. 20).


**Figure 20:** Status - Overview

The following table explains the parameters of the status summary:

| | |
|---|---|
| Init: | GPS mode. Currently only the “External” mode is available, which uses the gps chip of the external receiver (A07-RTK). |
| Quality: | Solution types: GPS, DGPS, Float, Fixed |
| Position: | Current position in Longitude, Latitude and Altitude |
| SOG: | Speed over ground in km/h |
| RMS: | RMSH (Root mean square horizontal) and RMSV (Root mean square vertical) values |
| PDOP/HDOP/VDOP: | Positional Dilution of Precision (accuracy degradation in 3D), Horizontal Dilution of Precision (accuracy degradation in horizontal direction), Vertical Dilution of Precision (accuracy degradation in vertical direction) |
| GPS, GLONASS, GALILEO, BEIDOU, QZSS, IRNSS: | Number of used and visible satellites of the corresponding satellite systems |
| Augmentation age: | Displays the data age when using correction data. |
| Date/Time: | Current date and time |

**Table 4:** Status summary

# 5 AGIS Interface

The *AGIS* interface contains the *main window*, *main menu*, *shortcut menu*, *menu icon* and *GNSS info* (see Fig. 21).

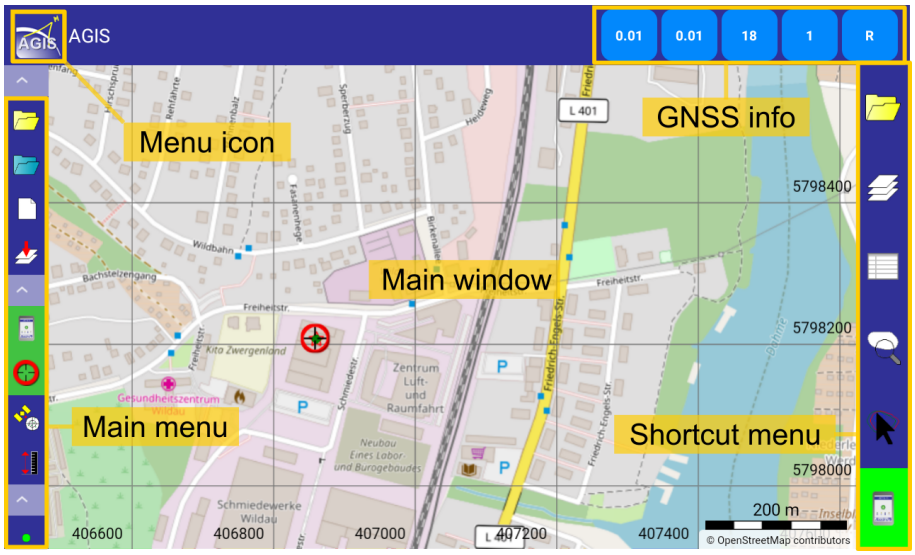



**Figure 21:** AGIS - Interface

In the *main window* the background map, shapefiles, grid, scale and current position can be displayed. All functions are listed in the *main menu* (see chapter 5.2). If this bar is dragged to the right, the software shows the description of the functions (see Fig. 22).


**Figure 22:** AGIS - Functions' description

Click the *menu icon* in the upper left corner to show or hide the *main menu*. The *shortcut menu* is located at the bottom (or to the right, depending on the orientation of the tablet or smartphone device) of the main window. The six functions are described in chapter 5.2. The *GNSS status* is displayed at the top right (see chapter 5.1).

## 5.1 GNSS information

By clicking on the fields of the *GNSS info* an overview of the *GNSS status* opens (see Fig. 23).

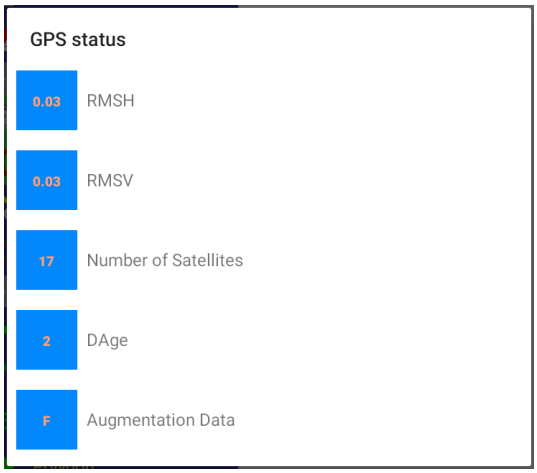



**Figure 23:** GNSS info

The first two lines show the horizontal and vertical accuracy (rms). The number of satellites used in the calculation of the position solution is displayed in the third line. The correction data age is displayed in the *DAge* line. This only applies if correction data is used. Otherwise, there is a *0* at this position. The *solution type* is displayed in the last line.

The possible solution types are:

- A - autonomous (standalone GNSS) → position calculation without correction data.
- F - RTK float → position calculation with correction data (carrier phase ambiguities resolved as floating point values).
- R - RTK fix → position calculation with correction data (carrier phase ambiguities resolved as integer values).
- V - invalid → the receiver does not provide any data.

These fields are colour coded and have the following meaning:

- Red - no satellites available.
- Yellow - position solution calculation was not possible.
- Green - position solution calculation was possible.
- Blue - position solution calculation with correction data.

If there is no connection to the *GNSS receiver* or to the *AGPS* application, a red line is displayed. To connect, press the *GPS* button in the main or shortcut menu (see Fig. 24).

**Figure 24:** GPS button

## 5.2 Main menu

The *main menu* consists of eight blocks: *Project*, *GPS*, *Record*, *Layer*, *Feature*, *Tools*, *Navigation* and *Settings*. The individual blocks can be hidden with the arrow keys. If the *main menu* is hidden by the *menu icon*, it can be opened along with its descriptions by dragging from left to right on the left side.

### 5.2.1 Project

The *Project* block consists of four options (see Fig. 25). The following options are available from top to bottom: *Open Project*, *Open Background Project*, *New Project* and *Add Layer*.

By clicking on the *Open Project* icon, an existing and previously defined project can be opened from a list.

To be able to access an existing project with measurements, for example, while retaining the current project structure, use the *Open background project* button to load a project in the background. For this, both projects must have the same coordinate system. Otherwise, the application issues the following error message: “Could not open background project. Coordinate System of background project is different from current project”.

**Figure 25:** Project block options

Different templates can be saved in the *New Project* menu. The default template is called *AGIS-Template*. You can also create your templates. The standard template can be found in the following directory:

eEntwicklung.net/eGIS/eTemplates/Standard/Templates/

Select a template and a pop-up window opens in which the *name* of the project can be entered (see Fig. 26). The name of the project must be confirmed with *OK*.

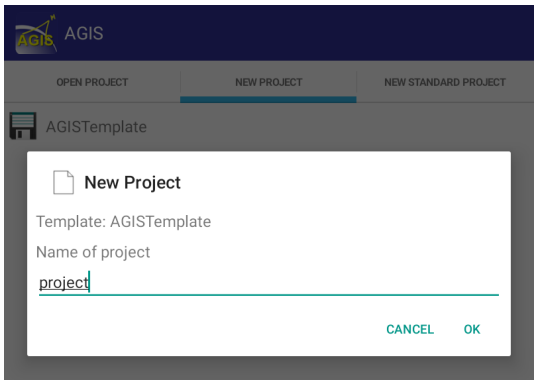



**Figure 26:** Creation of a new project

Afterwards, the window to define the coordinate system opens (see Fig. 27).

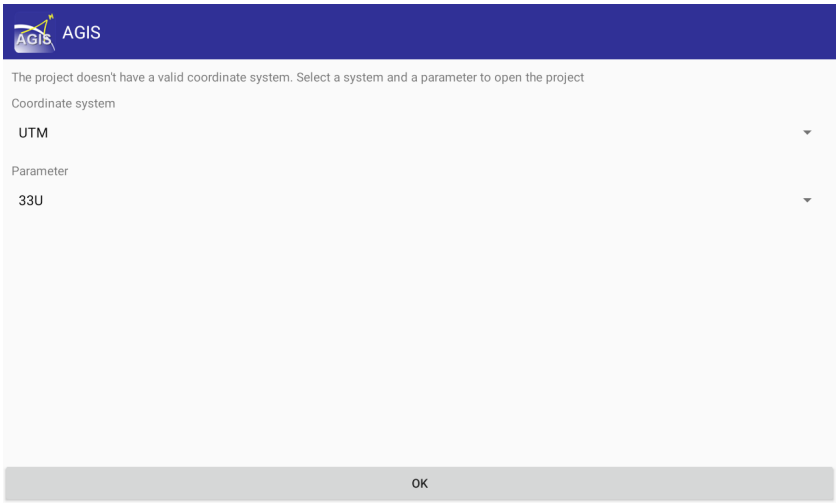



**Figure 27:** Selection of the coordinate system

The following table explains the supported and selectable coordinate systems:

| | |
|---|---|
| BMN: | Bundesmeldenetz, the former federal cartographic datum of Austria. Zones 28, 31 and 34 |
| EOV HD72: | Cartographic datum of Hungary. Oblique Mercator projection EOV (Egyseges Orszagos Vetületi rendszer), Hungarian Datum 1972 |
| ETRS: | European Terrestrial Reference System |
| ETRS 89: | European Terrestrial Reference System 89 |
| GK(A): | Gauss–Krüger transverse Mercator projection (Austria). Zones 28, 31 and 34 |
| GK(D): | Gauss–Krüger transverse Mercator projection (Germany) |
| UTM: | Universal Transverse Mercator, zones 29T, 29U, 30T, 30U, 30V, 31T, 31U, 32T, 32U, 32V, 33S, 33T, 33U, 33V, 33W, 34S, 34T, 34U, 34V, 34W, 35S, 35T, 35U, 35V, 35W, 36S, 36T, 36U, 36V, 36W, 37S, 37T, 37U, 37V, 37W, 38S, 38T, 38U, 38V and 38W |
| UTM N_: | Universal Transverse Mercator Northern Hemisphere, 60 zones |
| UTM S_: | Universal Transverse Mercator Southern Hemisphere, 60 zones |

**Table 5:** Selectable coordinate systems

The *coordinate system* and the *parameter* can be selected from a drop-down list. To finalize the creation of the project, press *OK*.

With the creation of a project, the layers *point*, *points*, *polyline*, *polygon* and *photos* are automatically created. Managing the layers will be described in chapter 5.2.4.

In addition to the menu items *Open project* and *New project*, the menu *New standard project* is offered as the third menu item. A project name must be entered in the first line (see Fig. 28). Afterwards, layers can be renamed and deactivated or activated. The structure of the layer (point, points, polyline or polygon) is displayed at the end of each line. Then press *Ok* and the window to determine a coordinate system opens (see Fig. 27).

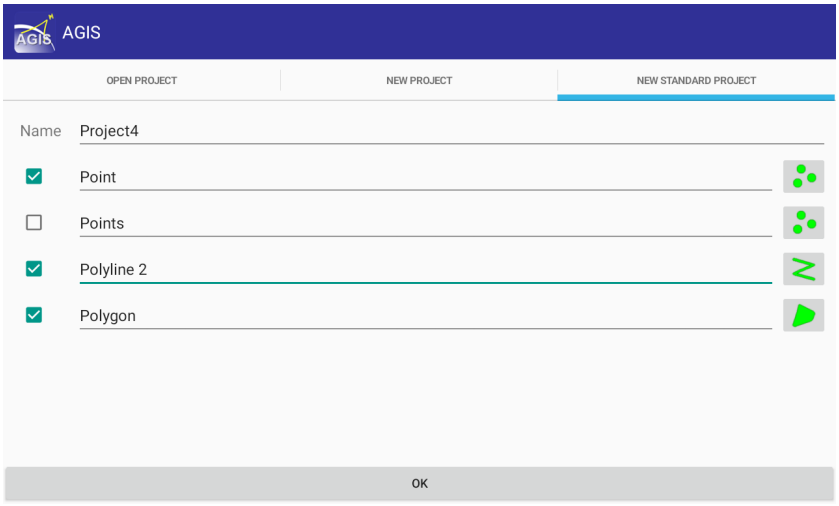



**Figure 28:** Creation of a new standard project

For example, if you deactivate the *polygon* layer, it will be greyed out in the *Record* menu. In the *feature list*, only the layers that have been activated are available for selection.

By pressing the fourth button *Add Layer*, the following dialogue opens:

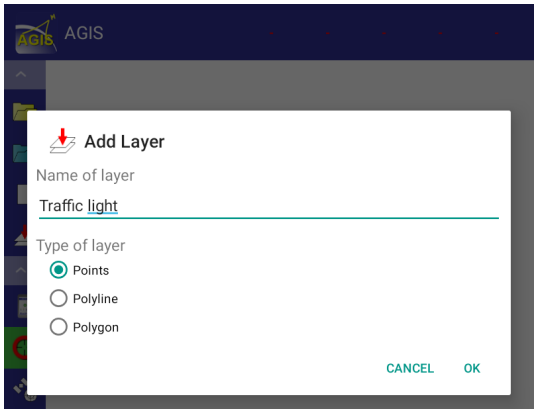



**Figure 29:** Adding a new layer

The *Layer name* and *Layer type* must be specified. By pressing *OK*, the layer is transferred to the currently selected project.

### 5.2.2 GPS

The *GPS* block consists of four options (see Fig. 30). The following options are available from top to bottom: *Enable GPS*, *GNSS cursor auto pan*, *GPS skyplot* and *Set pole height*.

**Figure 30:** GPS block options

After starting the *AGIS* application, there is initially no connection to a profile of the *AGPS* application. To connect, the first button *Enable GPS* must be pressed. This opens the *AGPS* application start page. Here you can open an existing profile or create a new one (see chapter 4).

The *GNSS cursor auto pan* button shifts the map so that your position on the map is in the middle of the screen depending on your actual GPS located position. To move freely on the map and deactivate the centring option click this button again.

The *GPS skyplot* button also opens the *AGPS* application. The current sky plot of the profile is displayed (see Fig. 19). This button is only active if a profile has been previously selected.

The *Set pole height* button allows you to specify the antenna height for this profile. The antenna height must be specified in cm (see Fig. 31). This height is applied during the measurements in the *AGIS* software.

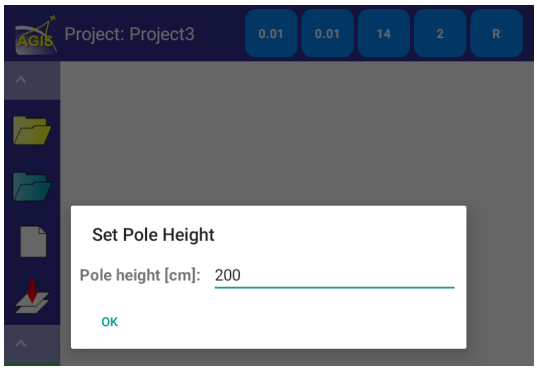



**Figure 31:** Specify the antenna height

### 5.2.3 Record

The *Record* block consists of four options (see Fig. 32). The following options are available from top to bottom: *Point*, *points*, *polyline* and *polygon*.

Select the corresponding button if you want to measure a *point* (first option) or *points* (second option). This will open a window, in which the destination layer must be selected (see Fig. 33). This window does not appear when measuring *lines* and *polygons*. The data is saved in the predefined layers.

**Figure 32:** Record block options

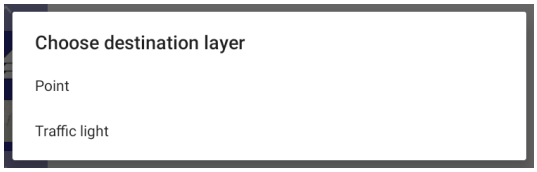



**Figure 33:** Selection of the destination layer

After selecting the measurement mode and the destination layer, the recording options appear in the upper left corner (see Fig. 34).

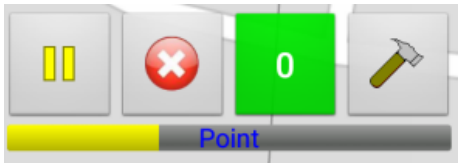



**Figure 34:** Recording Options - Point

By pressing the first button the recording can be started or stopped. The recording mode can be closed by pressing the second button. While recording *points*, *polylines* and *polygons*, this button changes to a *Save* button (diskette) after recording the first point. The third button shows how many points have already been recorded.

If this button is coloured green, the GNSS quality is good (position calculation with correction data, RTK fix). If this button is red, no recording is possible because the GNSS quality is bad (position calculation without correction data).

Use the last button (hammer) to select a recording profile. This option is only enabled when more than one measurement profile is available.

As soon as a recording is started, a recording bar appears below the buttons. The bar indicates which recording modes have been started. If the bar is yellow, the antenna can be positioned, for example. No recording is taking place at this moment. However, if it is red, it will record the points. If no recording is possible after 20 seconds, the third button also turns red and the system tries to measure the point again.

If the measurement is stopped and then saved, the application asks whether the recording process should be stopped (see Fig. 35).

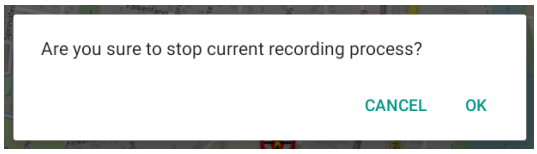



**Figure 35:** Confirmation to stop the recording process

Pressing *OK* opens a window with a field in which *comments* can be written. There is space here for a hundred characters (see Fig. 36). The field can also be left empty. The date and time are displayed below. In the measurement mode *Polyline*, the length in meters is also displayed. The area in square meters and the perimeter in meters are displayed in the *Polygon* measurement mode.

If *Cancel* is pressed, the measurement can be continued.

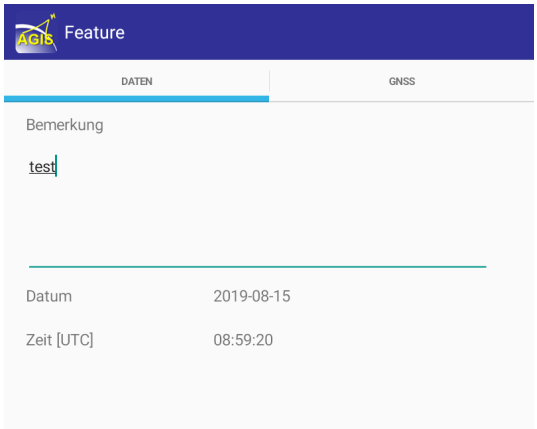



**Figure 36:** Comments for the measured element

The *GNSS* tab contains information about the measurement (see Fig. 37).

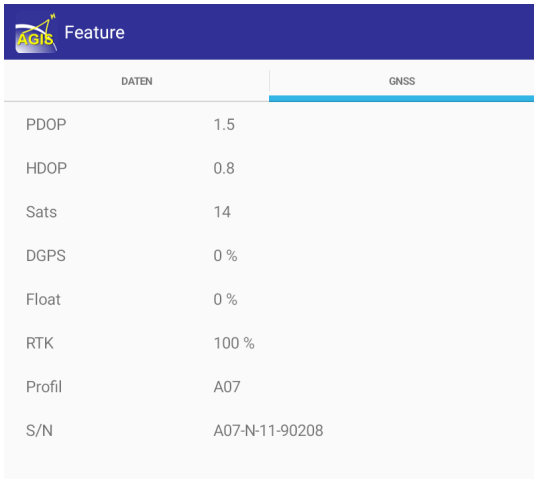



**Figure 37:** Information about the measurement

| | |
|---|---|
| PDOP | Accuracy degradation in 3D (Position Dilution of Precision) |
| HDOP | Accuracy degradation in horizontal direction (Horizontal Dilution of Precision) |
| Sats | Number of satellites during measurement |
| DGPS | Percentage with DGPS solution available |
| Float | Percentage with RTK float solution available |
| RTK | Percentage with RTK fix solution available |
| Profil | Selected recording profile |
| S/N | Serial number of the connected device (A07-RTK) |

**Table 6:** Description of the information presented

**Note:** When recording lines and areas, the start and end points as well as the line structure are saved in the corresponding layers. Chapter 5.2.6 describes how to save points from these elements.

### Recording georeferenced photos

For documentation purposes the function for recording georeferenced photos is available. Navigate to the *Record* menu, select the measurement mode *Point* and select the destination layer *Photos* (see Fig. 38).

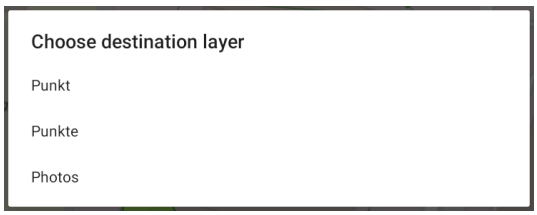



**Figure 38:** Selection of the destination layer photos

Start the measurement of the current position, by pressing the play button. Then, the application opens a window with three tabs. In the *Foto* tab (see Fig. 39), the *New photo* button switches to the camera mode of the hardware; then, take the photo and press *OK*. Another option is to select an existing photo, by clicking on the folder icon; then, select *Pick other image*, navigate to the corresponding directory and select the photo.

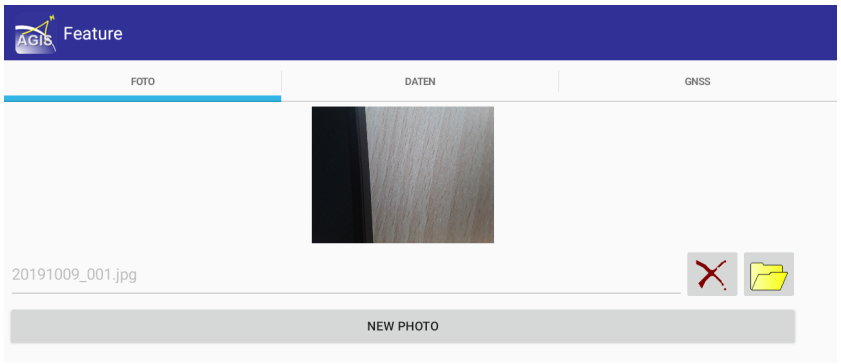



**Figure 39:** Record georeferenced photos

The *Daten* tab contains a field in which comments can be written. Finally, the *GNSS* tab contains information about the measurement. Return to the main menu by pressing the *back* button on the smartphone/tablet.

The photos are saved in the corresponding project in the following directory:

```
/storage/emulated/0/eEntwicklung.net/eGIS/eProjects/<Project>/Images
```

### 5.2.4 Layer

The *Layer* block consists of two options (see Fig. 40). The following options are available from top to bottom: *Layer* and *Download Offline Map*.

In the *Layer* menu, all layers of the current project are listed (see Fig. 41). Individual layers can be deactivated by clicking on the “Eye”. If a layer is clicked for a long time, all layers can be deactivated or activated (see Fig. 42). The measurements of the deactivated layers will not be displayed in the main window.

**Figure 40:** Layer block options

The *Base layer* tab displays the background maps used (see Fig. 43).

By clicking the *Base layer* option the background map can be switched on and off.

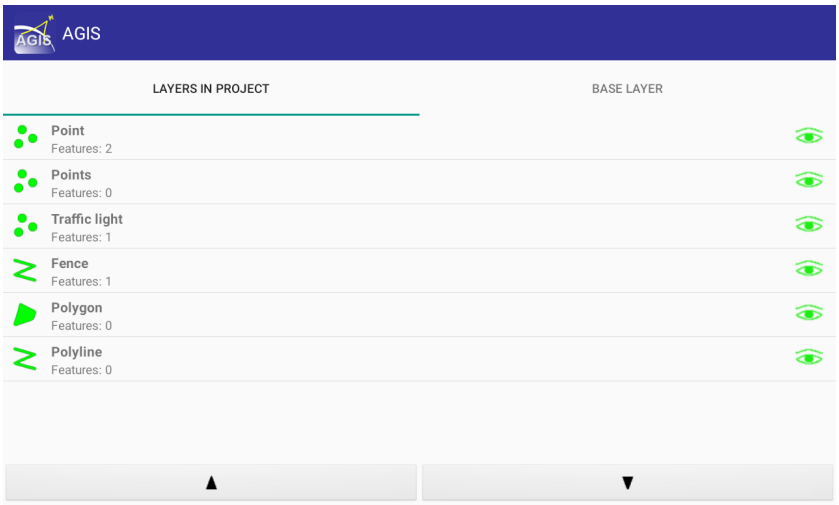



**Figure 41:** Display of layers in the current project


**Figure 42:** Deactivation or activation of layers

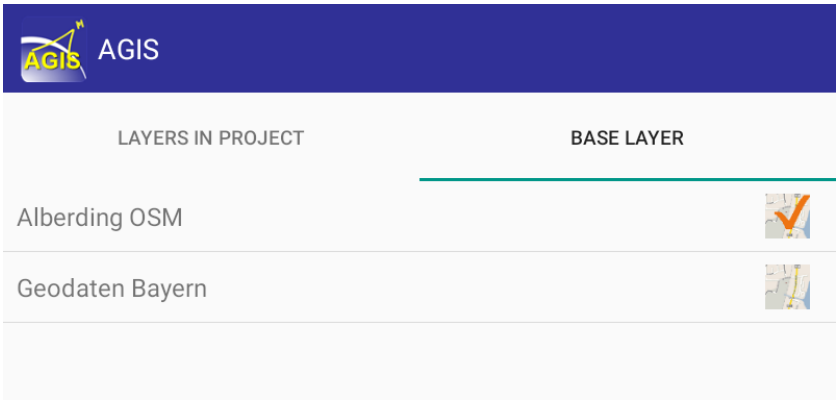



**Figure 43:** Selection of background map

Before you save an offline map, the base layer (Alberding OSM) must be activated, as explained before. Then click the *Download offline map* button. An area is automatically selected (see Fig. 44). The red frame indicates the area to be displayed offline. You can also define an area by dragging with your fingers. The level of details can be specified in the lower area. The more details are selected, the more zoom levels will be saved. A name for the offline map must be entered in the last field. Then, click the *Download* button. The offline maps can now be used in every existing and new project.

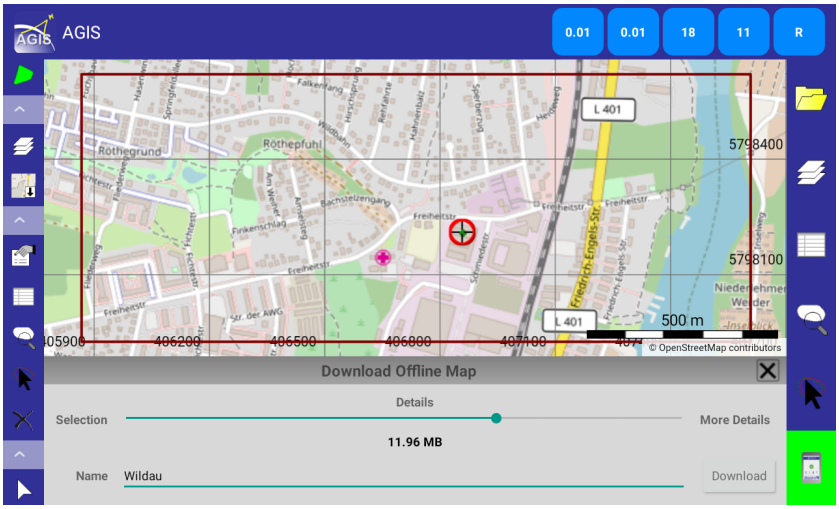



**Figure 44:** Download offline map

The download status is displayed in the *Layer* > *Base Layer* tab (see Fig. 45). Once the download is complete, you can uncheck *Alberding OSM* and select *<Given Name> (Alberding OSM)*. The offline map can then be used in areas without Internet or generally in the field if no mobile data (SIM card) is used in the tablet or smartphone.

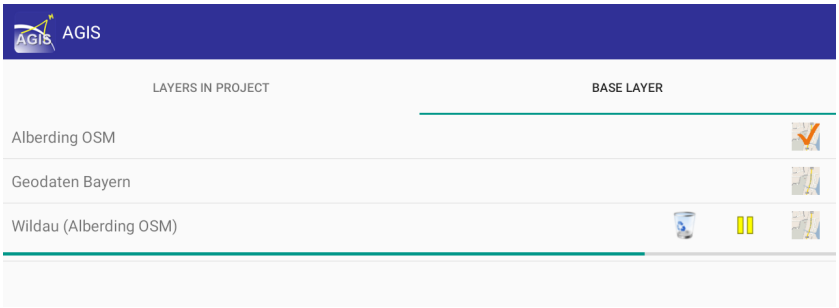



**Figure 45:** Download indicator of the offline map

**Note:** After activating the offline map, change the zoom level in the main window. Depending on the selected level of detail (*Details*), the offline map is only visible at a certain zoom level.

### 5.2.5 Feature

The *Feature* block consists of five options (see Fig. 46). The following options are available from top to bottom: *Feature Properties*, *Feature List*, *Overview/Detail*, *Select+* and *Delete Feature*.

The *Feature Properties* button is only active once a recording has been performed. When the button is clicked, a window opens with information about the last measurement (see Figs. 36 and 37).

The measured elements are listed in the *Feature lists*. By clicking on the dropdown menu of layers a list with all created layers opens (see Fig. 47). The number of measured elements is also displayed here. Selecting a layer opens the overview with the documented parameters. The stored elements of each recording mode are explained below.

**Figure 46:** Feature block options

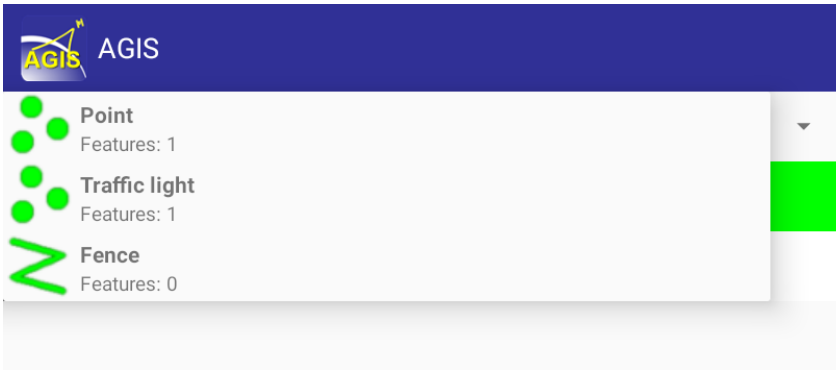



**Figure 47:** Layer selection

### Elements of the layers Point and Points

The lists show all the recorded *points*. The indices start at 1 (see Figs. 48 to 50). The column entries are explained below:

| | |
|---|---|
| X, Y, Z | Coordinates of the point in the defined coordinate system |
| Note | Comment that can be entered directly after the measurement |
| E_Date | Date of recording |
| E_Time | Time of recording in UTC |
| E_Serial | Serial number of the connected device (A07-RTK) |
| E_PName | Selected recording profile |
| E_HDOP | Accuracy degradation in horizontal direction during measurement (Horizontal Dilution of Precision) |
| E_PDOP | Accuracy degradation in 3D during measurement (Position Dilution of Precision) |
| E_SAT | Number of satellites during measurement |
| E_Float | Measurement with RTK float solution (1 = yes, 0 = no) |
| E_RTK | Measurement with RTK fix solution (1 = yes, 0 = no) |
| E_DGPS | Measurement with DGPS solution (1 = yes, 0 = no) |
| E_PoleH | Survey pole height |
| E_GeoidH | Geoid undulation in in metres |
| E_Baseline | Baseline length in metres |

**Table 7:** Elements of the layers Point and Points

With the ellipsoidal height and the point coordinates, the height above the mean sea level can be calculated on several Internet sites using global or regional geoid models.

AGIS

Point
Features: 2

| | X | Y | Z | NOTE | E_DATE | E_TIME |
|---|---|---|---|---|---|---|
| 1 | 406859.7748 | 5798206.9835 | 91.0290 | | 2019-08-15 | 09:01:44 |
| 2 | 406859.7726 | 5798206.9681 | 91.0350 | Light | 2019-08-15 | 09:21:19 |

**Figure 48:** Elements of the layers Point and Points (1)

AGIS

Point
Features: 2

| E_SERIAL | E_PNAME | E_HDOP | E_PDOP | E_SAT | E_FLOAT | E_RTK |
|---|---|---|---|---|---|---|
| A07-N-11-90208 | A07 | 0.8 | 1.5 | 14.0 | 0.00 | 1.00 |
| A07-N-11-90208 | A07 | 0.6 | 1.1 | 17.0 | 0.00 | 1.00 |

**Figure 49:** Elements of the layers Point and Points (2)

AGIS

Point
Features: 2

| | E_FLOAT | E_RTK | E_DGPS | E_POLEH | E_GEOIDH | E_BASELINE |
|---|---|---|---|---|---|---|
| | 0.00 | 1.00 | 0.00000 | 2.00000 | 0.00000 | 0.00000000000 |
| | 0.00 | 1.00 | 0.00000 | 2.00000 | 0.00000 | 0.00000000000 |

**Figure 50:** Elements of the layers Point and Points (3)

### Elements of the layer Polyline

The list includes each recorded *polyline*. The indices start at 1 (see Figs. 51 to 54). The following table only explains the elements not described in Table 7:

| | |
|---|---|
| E_Project | Project name |
| E_Speed | SOG (Speed over ground) in km/h during measurement |
| E_Length | Length of the polyline in m |
| E_StartX | X value of the start coordinate of the polyline in the defined coordinate system |
| E_StartY | Y value of the start coordinate of the polyline in the defined coordinate system |
| E_StartZ | Z value of the start coordinate of the polyline in the defined coordinate system |
| E_LastX | X value of the final coordinate of the polyline in the defined coordinate system |
| E_LastY | Y value of the final coordinate of the polyline in the defined coordinate system |
| E_LastZ | Z value of the final coordinate of the polyline in the defined coordinate system |

**Table 8:** Elements of the layer Polyline

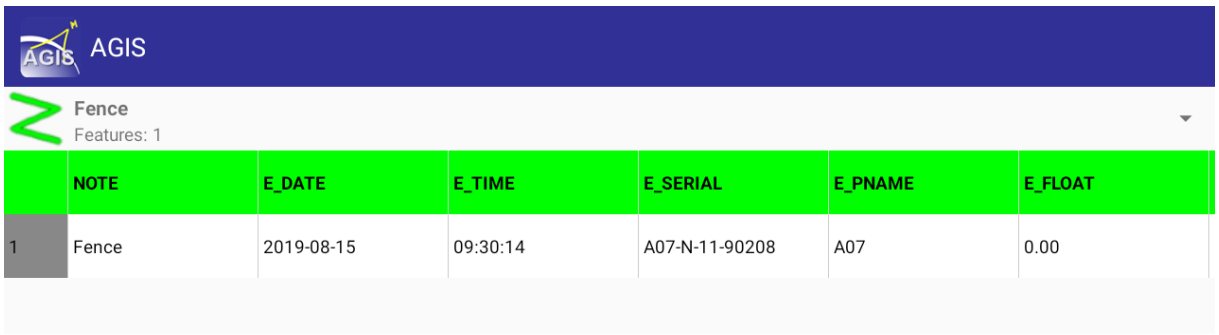
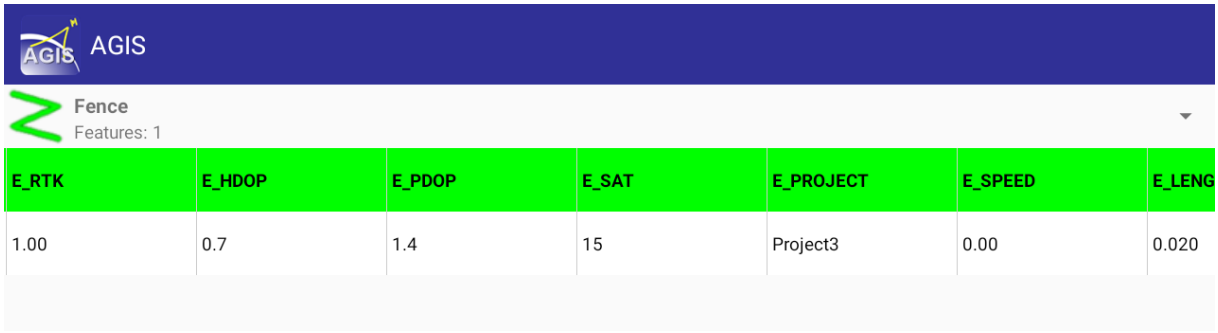
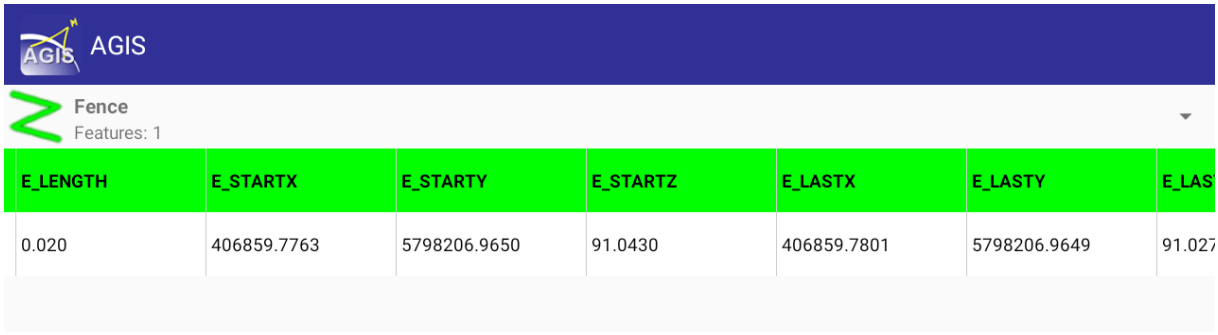



**Figure 51:** Elements of the layer Polyline (1)




| E_RTK | E_HDOP | E_PDOP | E_SAT | E_PROJECT | E_SPEED | E_LENG |
|---|---|---|---|---|---|---|
| 1.00 | 0.7 | 1.4 | 15 | Project3 | 0.00 | 0.020 |

**Figure 52:** Elements of the layer Polyline (2)




| E_LENGTH | E_STARTX | E_STARTY | E_STARTZ | E_LASTX | E_LASTY | E_LAS |
|---|---|---|---|---|---|---|
| 0.020 | 406859.7763 | 5798206.9650 | 91.0430 | 406859.7801 | 5798206.9649 | 91.027 |

**Figure 53:** Elements of the layer Polyline (3)


| | E_LASTY | E_LASTZ | E_DGPS | E_POLEH | E_GEOIDH | E_BASELINE |
|---|---|---|---|---|---|---|
| | 5798206.9649 | 91.0270 | 0.00000 | 2.00000 | 0.00000 | 0.00000000000 |

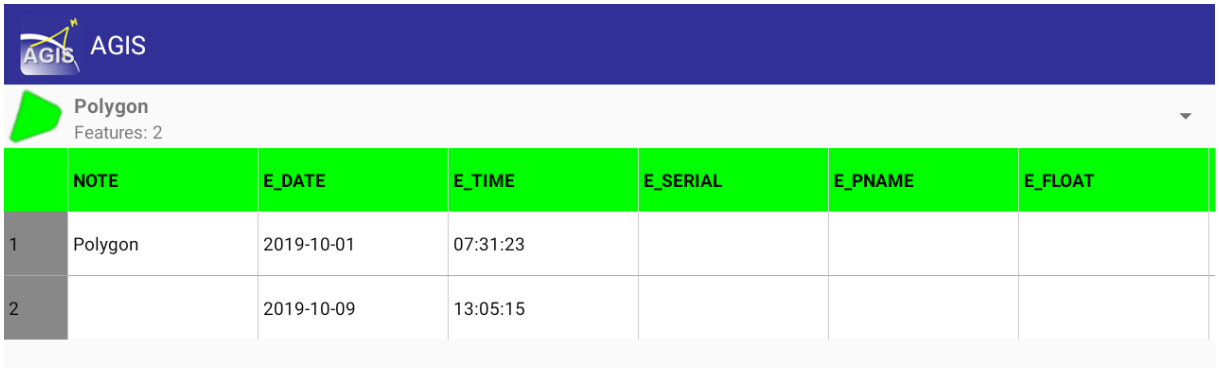
**Figure 54:** Elements of the layer Polyline (4)

### Elements of the layer Polygon

The list includes each recorded *polygon*. The indices start at 1 (see Figs. 55 to 58). The following table only explains the elements that were not described in tables 7 and 8:

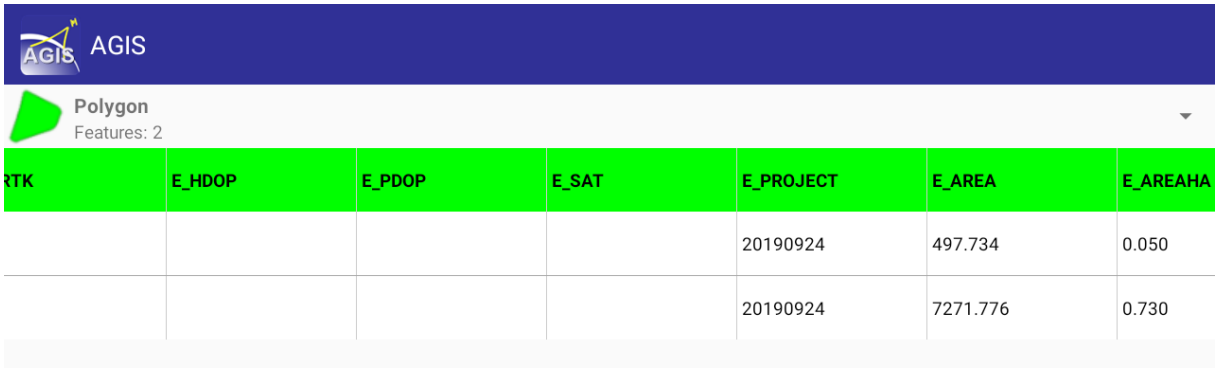
| | |
|---|---|
| E_Area | Area of the polygon in m² |
| E_AreaHa | Area of the polygon in ha |

**Table 9:** Elements of the layer Polygon



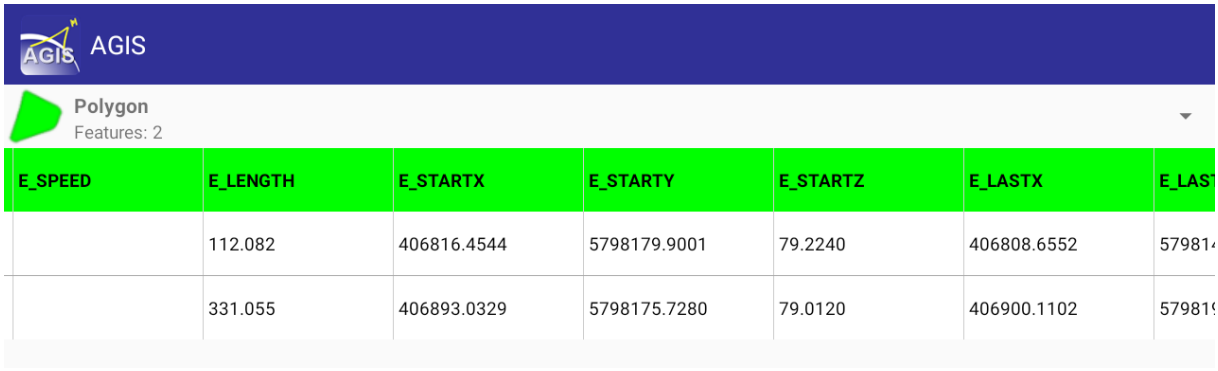

| | NOTE | E_DATE | E_TIME | E_SERIAL | E_PNAME | E_FLOAT |
|---|---|---|---|---|---|---|
| 1 | Polygon | 2019-10-01 | 07:31:23 | | | |
| 2 | | 2019-10-09 | 13:05:15 | | | |

**Figure 55:** Elements of the layer Polygon (1)



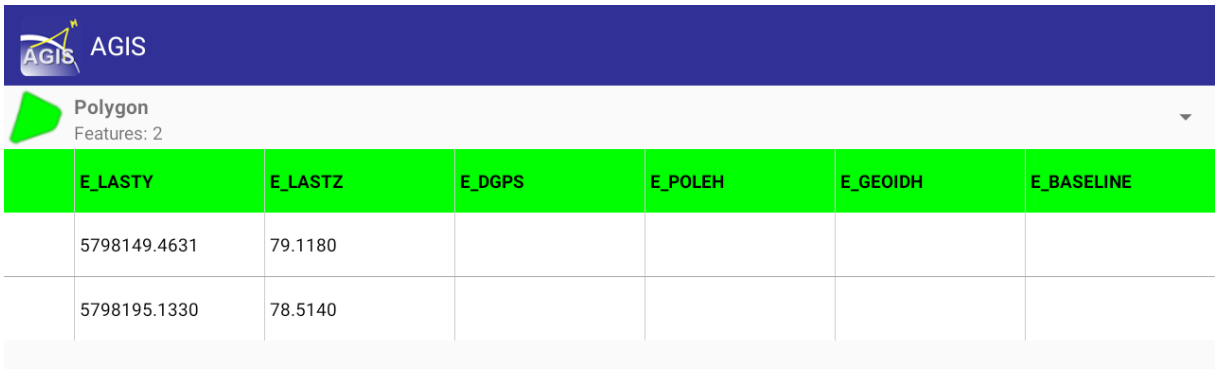

| RTK | E_HDOP | E_PDOP | E_SAT | E_PROJECT | E_AREA | E_AREAHA |
|---|---|---|---|---|---|---|
| | | | | 20190924 | 497.734 | 0.050 |
| | | | | 20190924 | 7271.776 | 0.730 |

**Figure 56:** Elements of the layer Polygon (2)




| E_SPEED | E_LENGTH | E_STARTX | E_STARTY | E_STARTZ | E_LASTX | E_LAS |
|---|---|---|---|---|---|---|
| | 112.082 | 406816.4544 | 5798179.9001 | 79.2240 | 406808.6552 | 57981 |
| | 331.055 | 406893.0329 | 5798175.7280 | 79.0120 | 406900.1102 | 57981 |

**Figure 57:** Elements of the layer Polygon (3)




| | E_LASTY | E_LASTZ | E_DGPS | E_POLEH | E_GEOIDH | E_BASELINE |
|---|---|---|---|---|---|---|
| | 5798149.4631 | 79.1180 | | | | |
| | 5798195.1330 | 78.5140 | | | | |

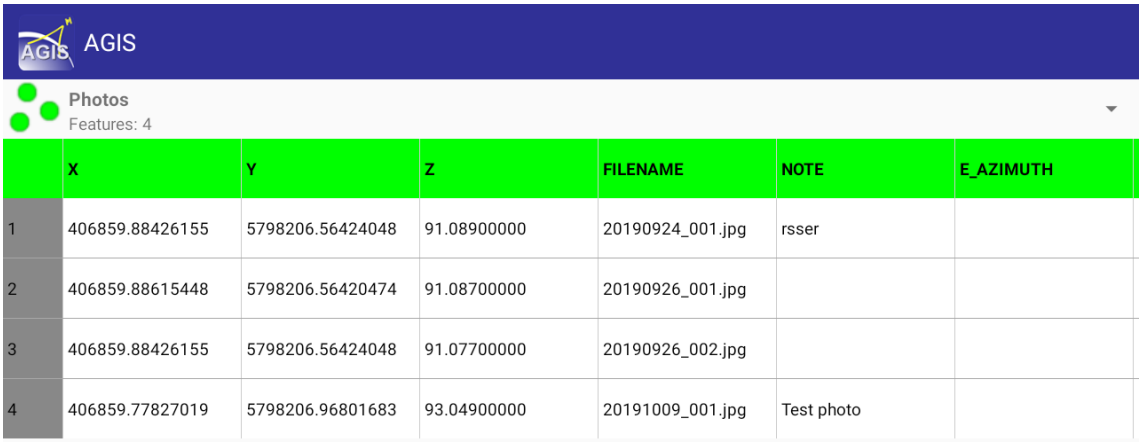
**Figure 58:** Elements of the layer Polygon (4)

## Elements of the layer Photos

The list includes each *photo* taken. The indices start at 1 (see Figs. Abb. 59 to 61). The following table only explains the elements not described in Tables 7 and 8:

| | |
|---|---|
| Filename | Photo file name |
| E_Azimuth | Not available |

**Table 10:** Elements of the layer Photos

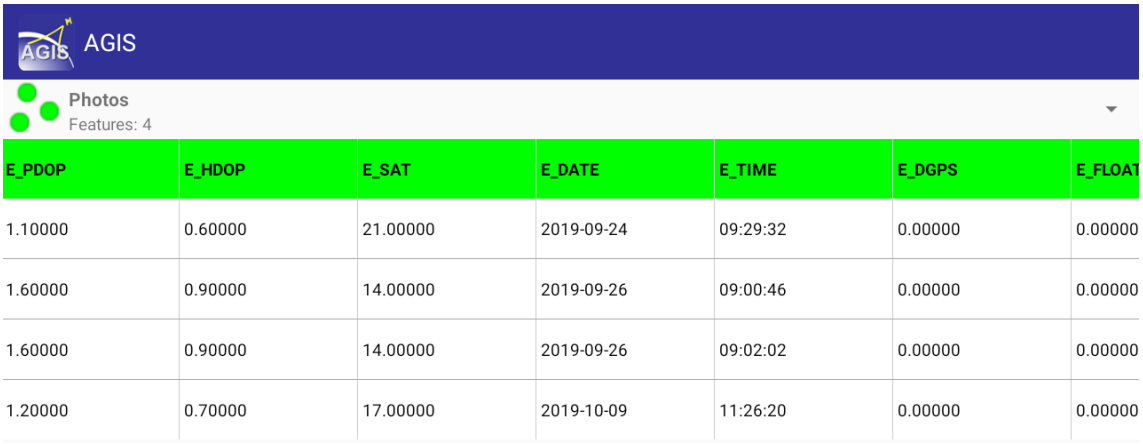


AGIS

Photos
Features: 4

| | X | Y | Z | FILENAME | NOTE | E_AZIMUTH |
|---|---|---|---|---|---|---|
| 1 | 406859.88426155 | 5798206.56424048 | 91.08900000 | 20190924_001.jpg | rsser | |
| 2 | 406859.88615448 | 5798206.56420474 | 91.08700000 | 20190926_001.jpg | | |
| 3 | 406859.88426155 | 5798206.56424048 | 91.07700000 | 20190926_002.jpg | | |
| 4 | 406859.77827019 | 5798206.96801683 | 93.04900000 | 20191009_001.jpg | Test photo | |

**Figure 59:** Elements of the layer Photos (1)

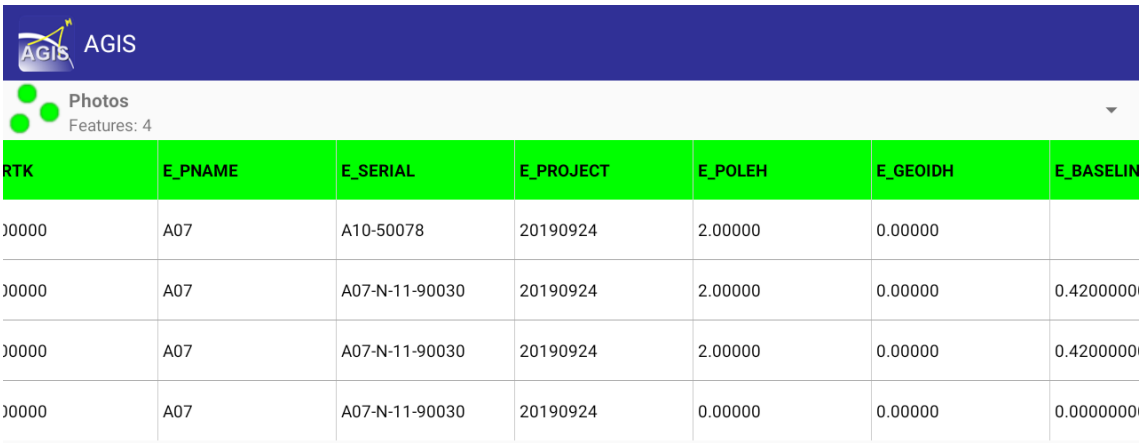


AGIS

Photos
Features: 4

| E_PDOP | E_HDOP | E_SAT | E_DATE | E_TIME | E_DGPS | E_FLOAT |
|---|---|---|---|---|---|---|
| 1.10000 | 0.60000 | 21.00000 | 2019-09-24 | 09:29:32 | 0.00000 | 0.00000 |
| 1.60000 | 0.90000 | 14.00000 | 2019-09-26 | 09:00:46 | 0.00000 | 0.00000 |
| 1.60000 | 0.90000 | 14.00000 | 2019-09-26 | 09:02:02 | 0.00000 | 0.00000 |
| 1.20000 | 0.70000 | 17.00000 | 2019-10-09 | 11:26:20 | 0.00000 | 0.00000 |

**Figure 60:** Elements of the layer Photos (2)



AGIS

Photos
Features: 4

| RTK | E_PNAME | E_SERIAL | E_PROJECT | E_POLEH | E_GEOIDH | E_BASELIN |
|---|---|---|---|---|---|---|
| )0000 | A07 | A10-50078 | 20190924 | 2.00000 | 0.00000 | |
| )0000 | A07 | A07-N-11-90030 | 20190924 | 2.00000 | 0.00000 | 0.4200000 |
| )0000 | A07 | A07-N-11-90030 | 20190924 | 2.00000 | 0.00000 | 0.4200000 |
| )0000 | A07 | A07-N-11-90030 | 20190924 | 0.00000 | 0.00000 | 0.0000000 |

**Figure 61:** Elements of the layer Photos (3)

Pressing the third button *Overview/Detail*, the application will zoom to the current measurement area.

The *Select+* tool allows you to select measured elements (*point*, *points*, *polylines* and *polygons*). If the *Delete feature* tool is then pressed, the application asks whether the element is really to be deleted. Once selected, the *Feature properties* button can also be pressed. The corresponding properties for the element will then open (see Figs. 36 and 37 in chapter 5.2.3).

### 5.2.6 Tools

The *Tools* block consists of five options (see Fig. 62). The following options are available from top to bottom: *Edit Points*, *Copy Feature*, *Create Feature*, *Feature -> Points* and *Create Raster*.

Before the *Edit Points* and *Copy Feature* buttons can be used, a measured element must be selected using the *Select+* tool.

The *Edit Points* button, after the selection, will open a window with the option to edit individual points under the main window (see Fig. 63). With a click on the *GPS* button, the position of the point can be changed or improved. To do this, the record options open in the upper left corner (see chapter 5.2.3).

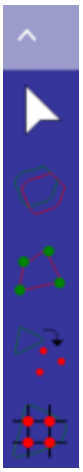


**Figure 62:** Tools block options

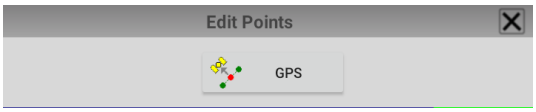



**Figure 63:** Editing points

For *Polyline* and *Polygon* recording modes, four options are available for the *Edit points* function (see Figs. 64 and 65).

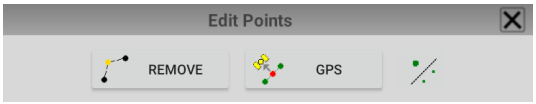



**Figure 64:** Editing polylines and polygons (1)


**Figure 65:** Editing polylines and polygons (2)

On the one hand, a point can be removed (*Remove*) or remeasured (*GPS*) and on the other hand, a point or several points can be inserted (*Insert*). Use the *Select+* tool within this function to insert points.

The *Copy feature* function, after the selection, will open a window below the main window (see Fig. 66). After pressing the *Save to* button, a layer must be selected and the feature is saved with all its properties.

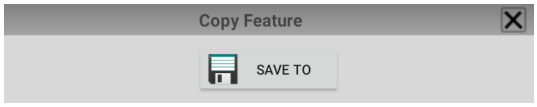



**Figure 66:** Copying points, polylines and polygons

The *Create feature* tool can be used to create *polylines* and *polygons* from points. After clicking on the function, the points to be saved as polylines or polygons must be marked with the *Select+* tool (see Fig. 67). The selection can be deleted by clicking on the red *X* (below, next to *Save to*). At least two points must be specified for a polyline and at least three points for a polygon. After clicking on *Save to*, the element is stored in the selected layer.

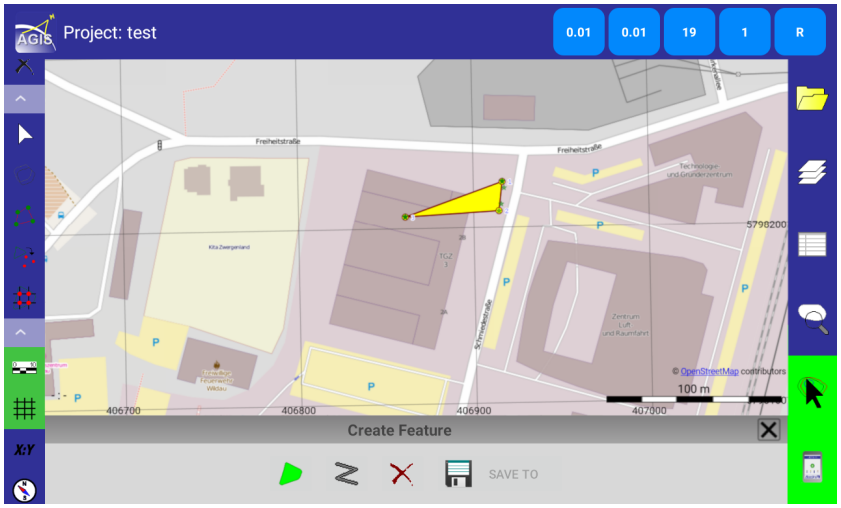



**Figure 67:** Creating a polygon or polyline from points

With the tool *Feature -> Points* you can save the measured points of the lines or polygons in the layer *Point* or *Points* by pressing *Save to* (see Fig. 68).

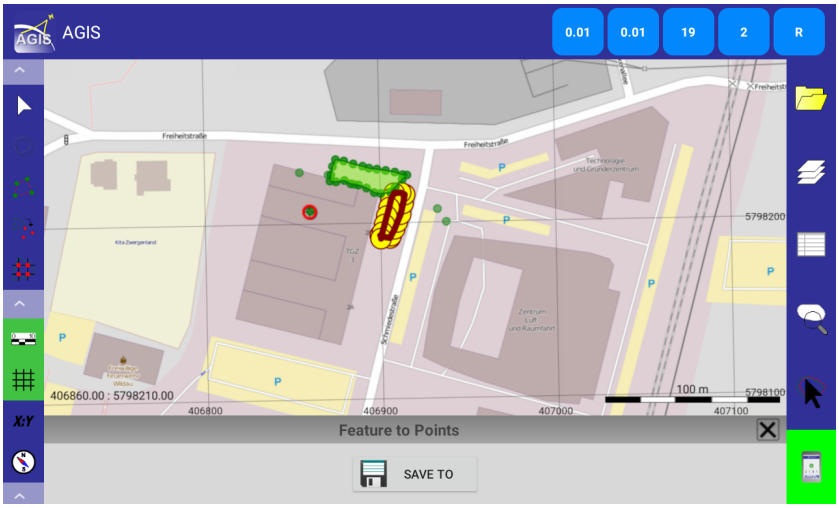



**Figure 68:** Saving points of polylines and polygons

When you click the *Create Raster* button, a window opens below the main window in which you can enter the parameters to create the raster (see Fig. 69).

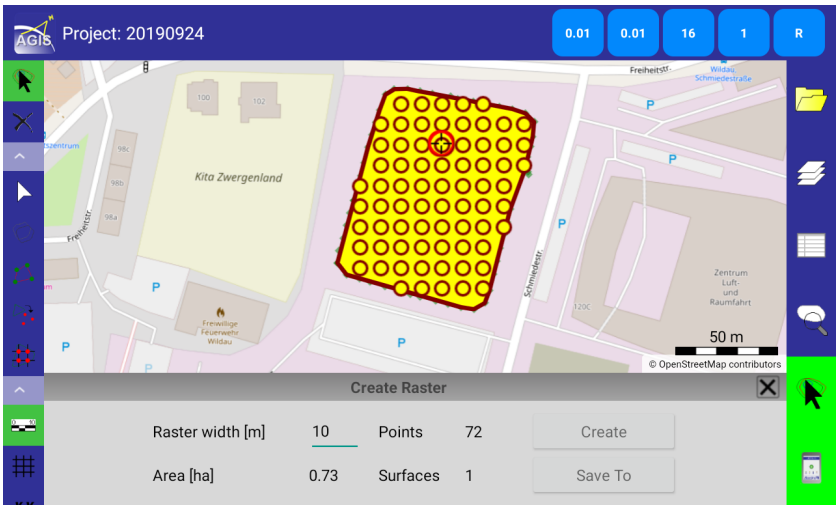



**Figure 69:** Creating a raster

Before you can create a raster, an area must be measured for the region where a grid will be created. Select one or more polygons using the *Select+* tool. In the *Raster width [m]* field, enter the distance between the grid points. The current position must be located inside the surface, then click the *Create* button. The raster is then created within the polygon at the specified raster distance starting from the current position. The number of 2D points created is displayed in the *Points* field, below this, the area in [ha] and the number of selected polygons are displayed. The 2D points can be saved to a layer by clicking the *Save to* button.

If there is no connection to the *Alberding A07-RTK*, the AGIS software asks for the coordinates of a starting point (see figure 70).

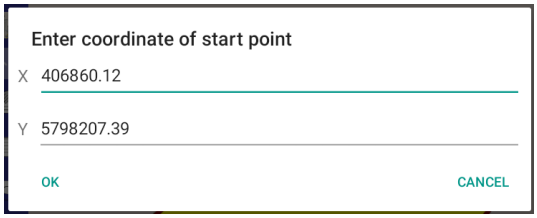



**Figure 70:** Create raster - coordinate of the starting point

### 5.2.7 Navigation

The *Navigation* block consists of four options (see Fig. 71). The following options are available from top to bottom: *Scale bar*, *Show grid*, *Show coordinates* and *Navigation*.


**Figure 71:** Navigation block options

The first three options are display alternatives in the main window. Press the corresponding button to display the *scale bar* (bottom right), the *grid* with coordinates, and the *GPS coordinates* (bottom left) in the main window.

A click on the *Navigation* button opens the *Navigation* window below the main window (see Fig. 72). The coordinates for the current location (*X1* and *Y1*) are automatically provided by the application. The coordinates of the target point (*X2* and *Y2*) must be entered in the defined coordinate system. The target point can also be selected with the *Select+* tool if it was previously measured or imported as a shapefile.

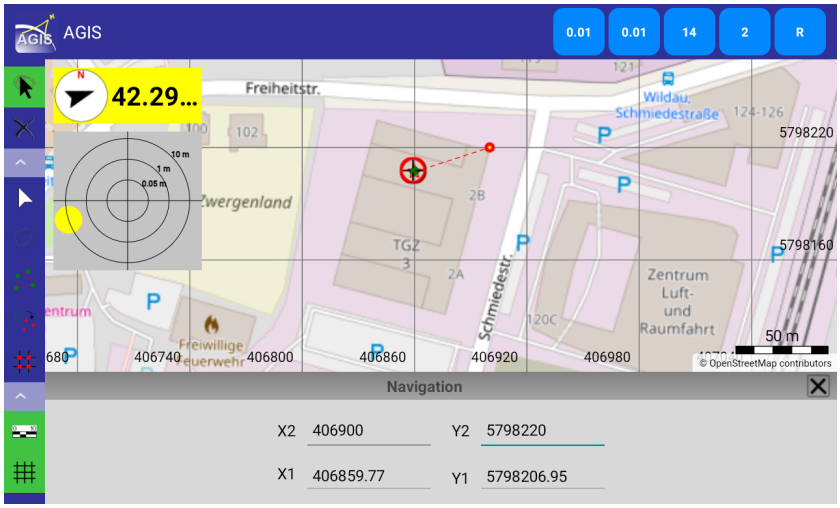



**Figure 72:** Navigation - Display

When you enter the target coordinates, a separate box opens in the upper left corner. The compass (north arrow) shows the direction to the destination point and the number to the right the distance in meters. If this display is clicked, a reticle with the distance rings 0.05 m, 1 m and 10 m opens below. The point shown corresponds to the current position. The representation can be enlarged by clicking on the reticle (see Fig. 73).

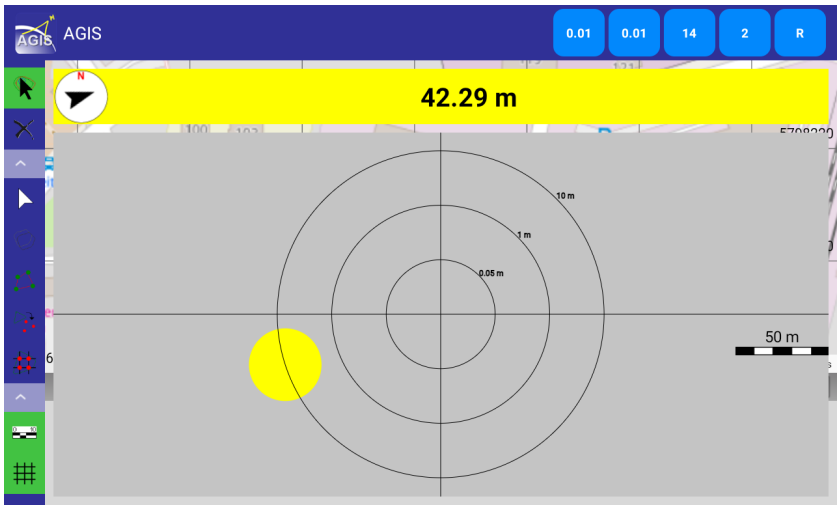



**Figure 73:** Navigation - Reticle

The colours of the point in the reticle and the background of the display indicate the distance to the target point. The colours correspond to the following distances:

| Colour | Distance |
|---|---|
| blue | 0 - 1 m |
| green | 1 - 10 m |
| yellow | 10 - 100 m |
| red | 100 - 1000 m |
| grey | more than 1000 m and if the input of the target coordinates has not been completed |

**Table 11:** Meaning of the colours for the navigation function

### 5.2.8 Settings

The *Settings* block consists of two options (see Fig. 74). The following options are available from top to bottom: *AGIS options* and *info about...*.

**Figure 74:** Settings block options

In the *AGIS Options* window, the *project directory* for saving projects and measurements can be defined (see Fig. 75). The default directory is the *eProjects* folder, which is automatically created when saving. To define one manually, the *Use defined directory* button must be activated. Click *Change directory* to select the desired location.

A folder with the name of the project is created for each project. The created layers (e.g. *point*, *points*, *line* and *polygon*) are stored in this folder in different files.

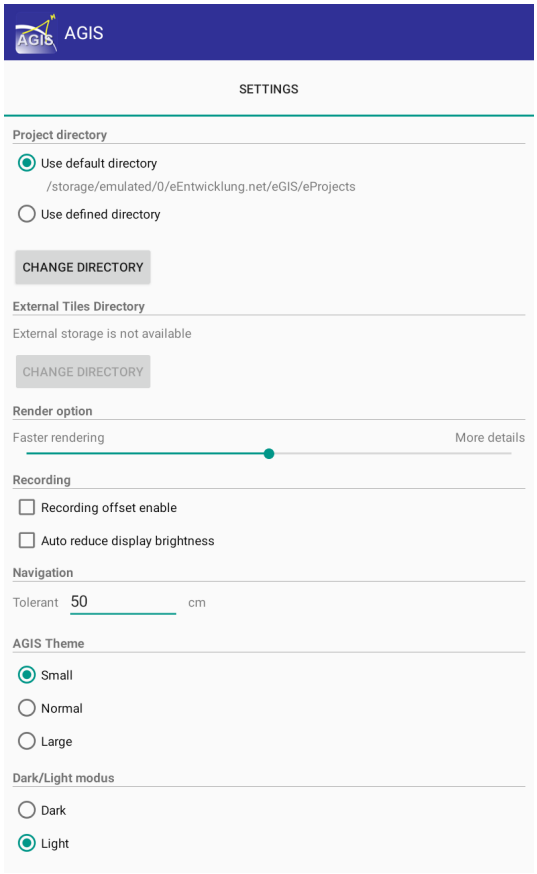



**Figure 75:** AGIS settings

The following file types are stored per layer:

| | |
|---|---|
| shp | contains geometry data |
| shx | contains geometry indices for linking attribute data |
| dbf | contains attribute data; this file can also be opened in Excel (Microsoft, OpenOffice). |
| dat | contains the attributes of the layers |
| eec | contains configurations, projections, symbologies, etc. of the coordinate system |

**Table 12:** File types

The file types *shp*, *shx* and *dbf* can be used to display and edit the measurements in a GIS system (e.g. QGIS, ArcGIS).

To *Render faster* or to display with *More details*, the bar under *Render option* must be moved accordingly.

The *Recording* options *Recording offset enable* and *Auto reduce display brightness* are currently not available.

Selecting the *AGIS theme* determines the size of the icons in the main menu and shortcut menu. It is set to *Normal* by default.

When switching to *Dark/Light mode*, the background in the different menus/functions changes from light to dark and vice versa.

The software version and the copyright are displayed after clicking the button *Info about...* (see Fig. 76).

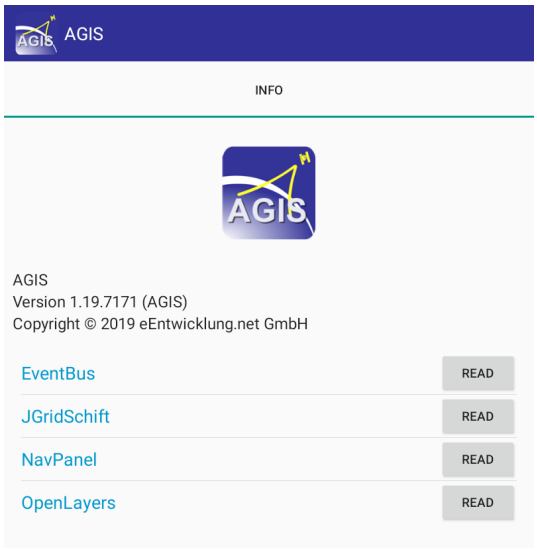



**Figure 76:** Software Information

## 5.3 Importing files

In the AGIS software it is possible to import or copy text files or entire projects in the form of shape files for staking out and maintaining data.

### 5.3.1 Text files

Text files (*.txt) with the following formatting can be loaded:

**Note** (e.g. point number) **X** (e.g. easting) **Y** (e.g. northing) **Z** (e.g. height)

or

**Note** (e.g. point number) **X** (e.g. easting) **Y** (e.g. northing)

The columns must be separated by **two** spaces.

The following procedure should be followed when loading:

- Create a project in AGIS
- Copy the file to the project directory (eEntwicklung.net/eGIS/eProjects/<Project name>/)
- Reopen the project in AGIS

The coordinate system for the project in AGIS and the coordinate system of the points in the text files **must** be the same.

The data is automatically imported into a new layer. The name of the layer corresponds to the name of the file.

Only numbers are permitted for the *Point number*.

# 6 Network protocols and security settings

The AGIS software uses HTTP/HTTPS to access map servers for retrieving background maps. The A07 hardware uses Ntrip (an HTTPS variant) to obtain the correction data for RTK positioning. Basic support protocols of the operating system, such as DNS, are also required depending on the individual settings.

Direct access to the A07 hardware via USB is possible using the configuration software. This software allows to access and change the configuration.

When the correction data is accessed via Ntrip, the user name and password are transmitted with basic authentication. By default, the position data required by the server to generate the corrections is also sent regularly to the server.

The software on the Android system does not make any Internet connections except for map download via HTTP/HTTPS. No scripts or active content from other sources are used or executed.