

Penetrologger DS Logger 500

AFS AGRO FLOW SYSTEM GmbH

User manual



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1. INTRODUCTION

Thank you for choosing Penetrologger DS Logger 500 of AFS AGRO FLOW SYSTEM. This manual will help familiarize you with the features, operations, and maintenance of the penetrometer. Please carefully read this manual before operating.

DS Logger 500 is a cross-functional device for soil compaction, temperature, and moisture and soil conductivity measuring. The device helps identify and resolve not only the soil compaction problem, but also hold general soil research to improve crop yields. The device can penetrate to a depth of 45 cm, and measure electrical conductivity and soil moisture up to 60 cm. It is widely used in agriculture in studying the conditions for plant germination, the identification of compacted soil layers, for example, layers, under the plow.

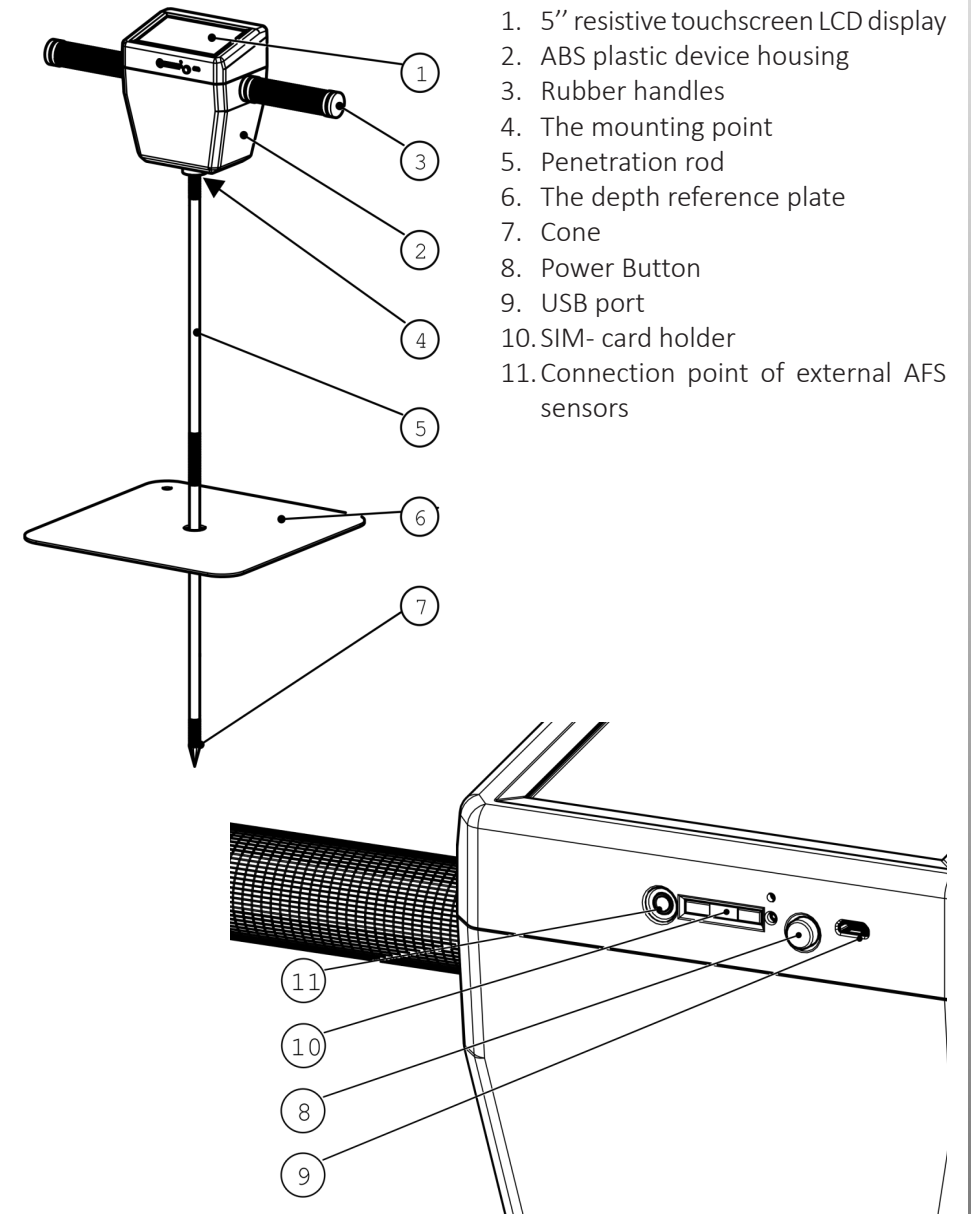
Measuring before basic soil handling will help locate where and to what depth the layers of the soil are compacted. Use a penetrometer to evaluate the depth of the treated layer after the plowing.

Clear and intuitive device menu will facilitate the working process. The convenient settings menu allows you to select the tip type, the appropriate measurement units, menu language. Maps and graphs of measurements provide not only basic information, but also help you better analyze the data obtained during the measurement before you transfer it to your personal AFS Account; compare data taken at different periods, but in the same area; monitor the problem points on the map.

With DS Logger 500 you can assign different types of tasks to workers at the relevant points and track the correctness of their performance. The internal memory of the measuring device can record data, eliminating the need for manual notes. With the integrated GPS module, coordinates, time and date of measurements are automatically recorded. The device menu is available in four languages: English, German, French and Italian.

DS Logger 500 can synchronize files, upload them to the server, where they can be managed in Personal AFS Account; transfer tasks and field data, update the software via wireless and through a USB connection.

2. DEVICE CONSTRUCTION



3. ASSEMBLY

The kit consists of the device, two parts of the penetrating rod, cones of different diameters, a charger, a USB cable and the depth reference plate.

Connect the two parts to the thread, select the tip type and attach the tip as shown in the image. Connect the two parts to each other, select correct tip and connect it as shown in the Figure 1.

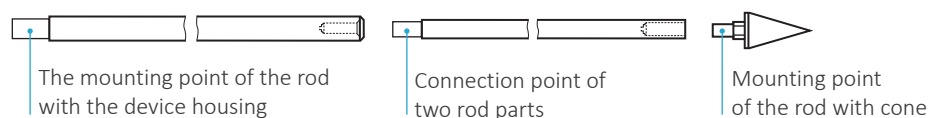


Figure 1

Cone 1/2" for:

- measurements in places of the frequent turning of farm machinery;
- measurements on loamy, clayey soils or soils with a large amount of solid particles or plant residues.

Cone 3/4" for:

- measurements on crumbly soils;
- checking the depth of plowed soil;
- measurements on sandy soils.

The penetrating rod connects to the device with a threaded connection. Screw it to the device DS Logger 500, as shown in Figure 2, clockwise until it reaches the stop. The electrical connection of the sensor will be carried out automatically with the help of spring contacts. Connect the soil moisture and electrical conductivity sensor in the same way.

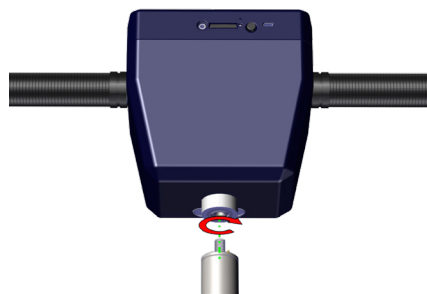


Figure 2

4. SOIL PREPARATION FOR MEASUREMENTS

Use the depth reference plate. Choose an area of at least 50x50 cm without high vegetation, so that between the distance sensor on the bottom of the housing and depth reference plate there was free space.

Remove plant residues, stones, and surface soil crust. Level the surface and put the depth reference plate on it (Figure 3).

Warning!

Do not press on the depth reference plate, do not throw a penetrometer with the connected sensor to prevent damages.

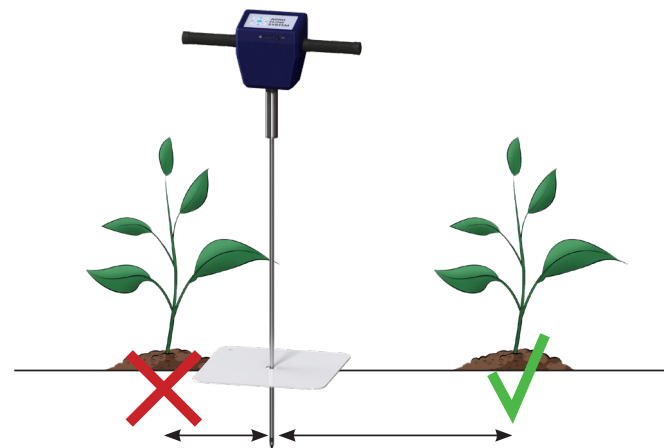


Figure 3

5. OPERATING FEATURES

- Do not use the device for chemicals testing and to determine the soil compaction during construction.
- Do not use a device for testing concrete and other solutions.
- Do not use the device on soils that contain a large amount of solid particles.

6. SIM-CARD INSTALLATION

To transfer the measurement results to the server, install the SIM-card. The SIM-card holder is located in the front of the penetrometer. To get a SIM-card holder, click on the button with SIM-card tray opening tool (Figure 4), place the standard SIM-card in the holder with the contacts up and place the holder back (Figure 5).

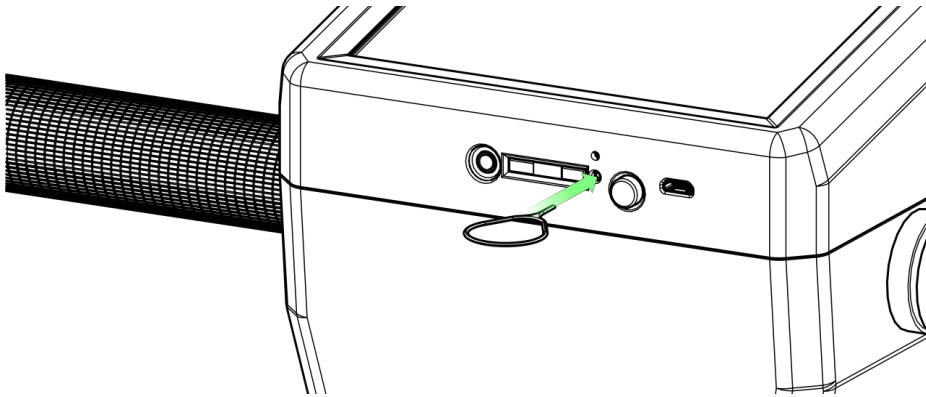


Figure 4

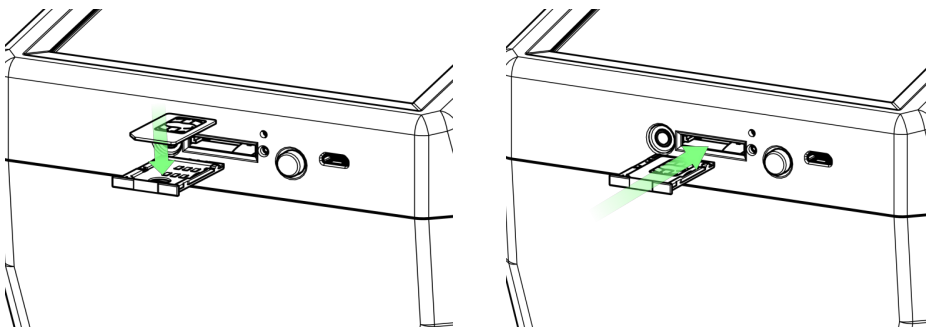


Figure 5

7. MEASUREMENT

7.1. ACTIVATING

Turn on the device pressing the power button (Figure 6).



Figure 6

7.2. HOME

On the main page are displayed (Figure 7):

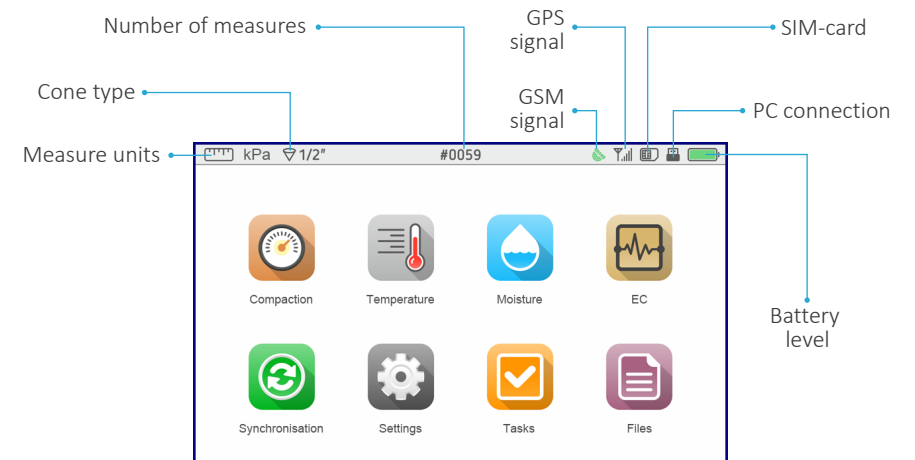


Figure 7

7.3. SETTINGS

On the SETTINGS page, you can select CONE TYPE, UNITS OF MEASURE, MEASURING METHOD, LANGUAGE, BRIGHTNESS AND REMOVE DATA.

LANGUAGE MENU

The device menu is available in four languages: English, German, French, and Italian. Choose your preferred language. To return to the SETTINGS menu, press the BACK, to return to the main page, press the HOME (Figure 8).

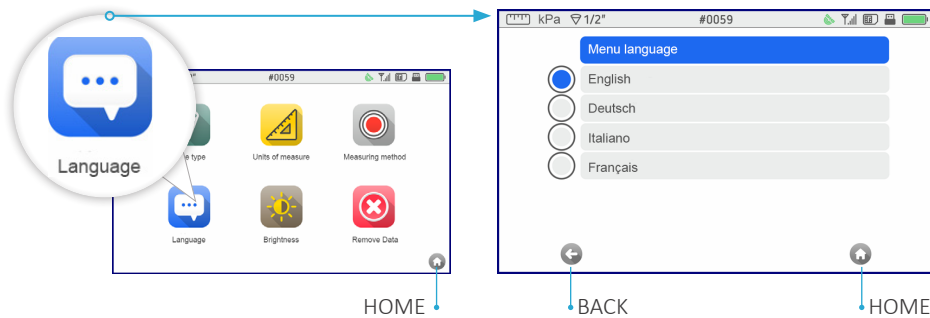


Figure 8

CONE TYPE MENU

Choose the type of measuring cone according to the soil type. To return to the SETTINGS menu, press the BACK, to return to the main page, press the HOME (Figure 9).

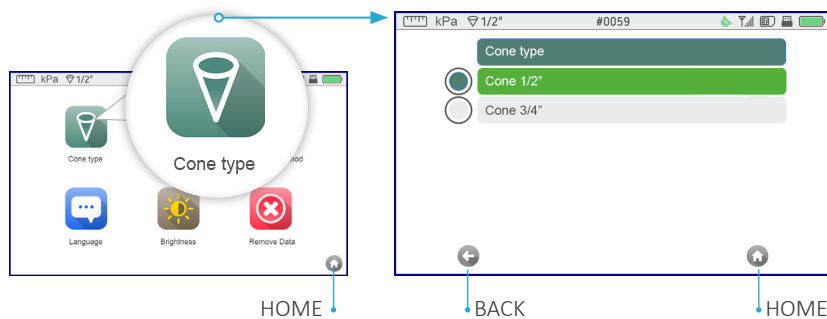


Figure 9

UNITS OF MEASURE MENU

Compaction measurement data can be displayed in several units: kPa, psi and kgf/cm². The selected unit will be displayed at the upper left of the display. Choose the preferred unit of measure. Select psi, and the depth will be displayed in inches. To return to the SETTINGS menu, press the BACK, to return to the main page, press the HOME (Figure 10).

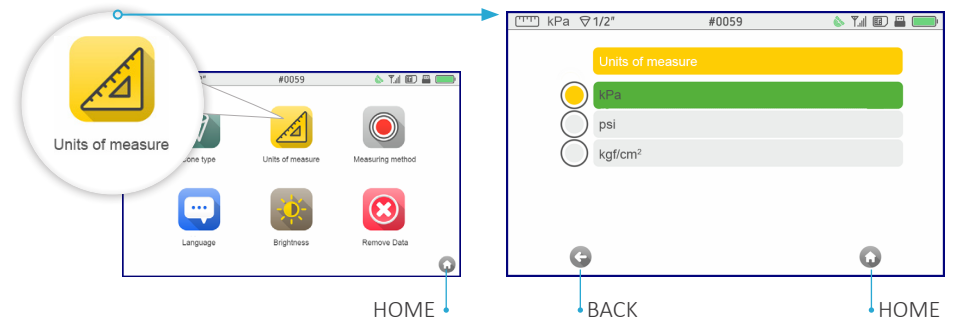


Figure 10

MEASURING METHOD MENU

In the MEASURING METHOD menu select the method for soil moisture (volumetric water content in the soil) measuring: DSM 600-S – static method (measuring the volumetric water content in the soil at one depth) or DSM 600-D – dynamic method (measuring the volumetric water content in the soil at a depth of 60 cm with 5 cm measuring step). To return to the SETTINGS menu, press the BACK, to return to the main page, press the HOME (Figure 11).

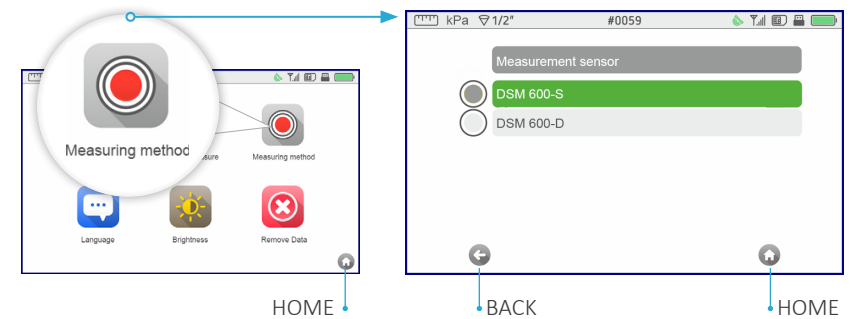


Figure 11

BRIGHTNESS MENU

Use the + and - buttons to control the brightness level (Figure 12). If the device does not operate for more than 60 seconds, It switches to moderate brightness. Click on any display area to return to the selected brightness level.

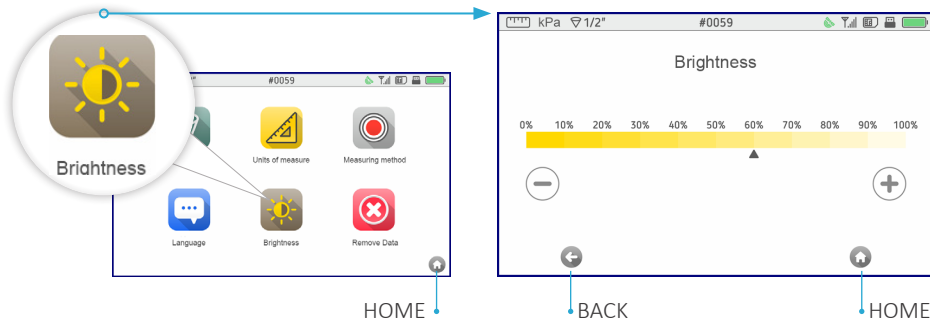


Figure 12

REMOVE DATA MENU

In the REMOVE DATA menu, select the type of compaction, moisture, temperature or electrical conductivity measurement files that you want to delete, and click DELETE.

If you have selected a group of files to delete by mistake, click CANCEL button. To return to the main page, press HOME (Figure 13).

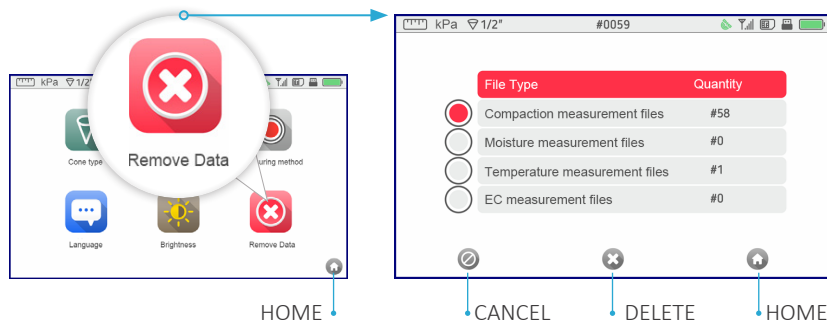


Figure 13

7.4. COMPACTION MEASUREMENTS

On HOME page press COMPACTION button to switch to the compaction measurement mode. Before beginning the compaction measurement, make sure that you have completed all the necessary settings and preparatory actions to measure. Wait for the signal from the GPS satellite, the satellite icon at the upper right of the display will turn green (Figure 14).

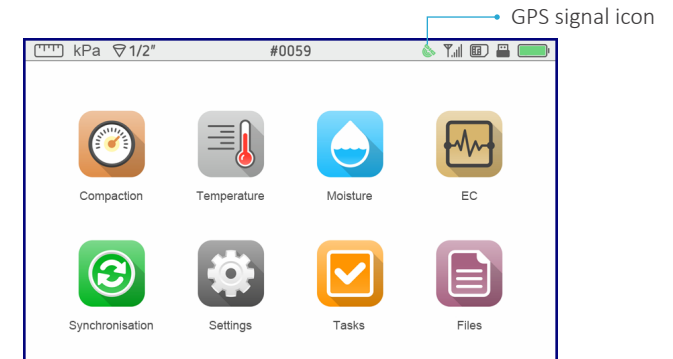


Figure 14

Before measurements complete all the necessary settings and preparatory actions. Move down the penetrometer with a pointed cone to the depth reference plate without pushing it into the ground.

Turn on the required measurement mode on the penetrometer. Move the penetration probe to the hole in the middle of the depth reference plate, put press on the penetrometer with the constant speed at right angles to the plate, gradually pushing the measuring part in the ground.

If the process measurement becomes impossible due to the obstacle (solid rock, vegetable residues, etc.), do not try to put more efforts to overcome obstacles, and carefully remove the sensor from the ground and make one more measure as close as possible to the previous but not less than 10 cm.

Nevertheless, it is possible to save the results of the measurement at the depth to which the measurement was performed, or press the CANCEL button. To return to the main page, press HOME or BACK.

Animation line at the upper of the display shows changes during soil compaction measurement, and the animation line at the bottom shows the penetration depth of the working rod (Figure 15).

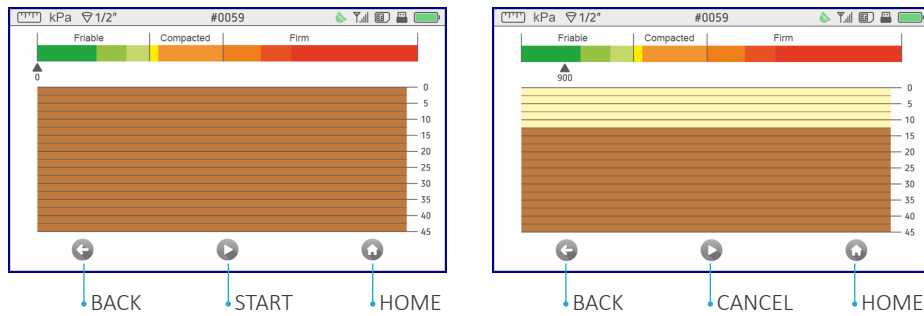


Figure 15

After measuring, a table with fixed measurement results every 25 mm is displayed on the display. Compaction measurement data can be viewed also in the form of a graph. Press SAVE to save the measurement, or BACK to return to the measurement page. When you return to the measurement page, the data is not saved (Figure 16).

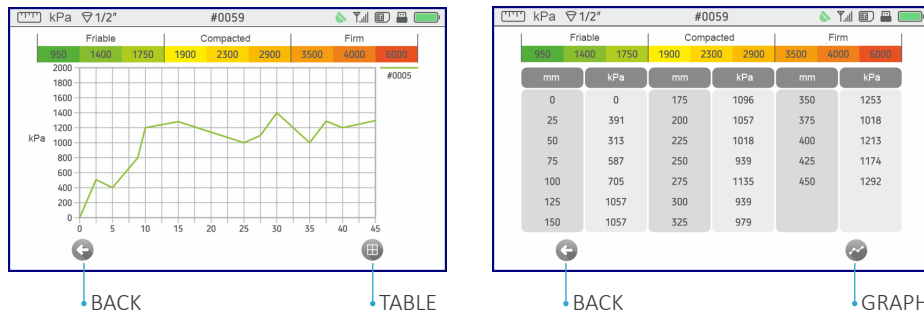


Figure 16

7.5. MOISTURE MEASUREMENTS

In the MEASURING METHOD menu select the method for soil moisture (volumetric water content in the soil) measuring: DSM 600-S – static method (measuring the volumetric water content in the soil at one depth) or DSM 600-D – dynamic method (measuring the volumetric water content in the soil at a depth of 60cm with 5 cm measuring step) (see page 10).

Before beginning the compaction measurement, make sure that you have completed all the necessary settings and preparatory actions to measure (see page 6), Move down the penetrometer with a pointed cone to the depth reference plate without pushing it into the ground. On HOME page press MOISTURE button. Wait for the signal from the GPS satellite, the satellite icon at the upper right of the display will turn green (Figure 14).

7.5.1 . DYNAMIC METHOD

Level the surface and put the depth reference plate on it in the case of dynamic measurement at different depths.

Move the sensor to the hole in the middle of the depth reference plate and press START, put press on the penetrometer with the constant speed at right angles to the plate, gradually pushing the measuring part in the ground.

Animation line at the upper of the display shows changes during soil moisture measurement, and the animation line at the bottom shows immersion depth of the sensor.

If the process measurement becomes impossible due to the obstacle (solid rock, vegetable residues, etc.), do not try to put more efforts to overcome obstacles. Nevertheless, it is possible to save the results of the measurement at the depth to which the measurement was performed, or press the CANCEL button. To return to the main page, press HOME or BACK (Figure 17).

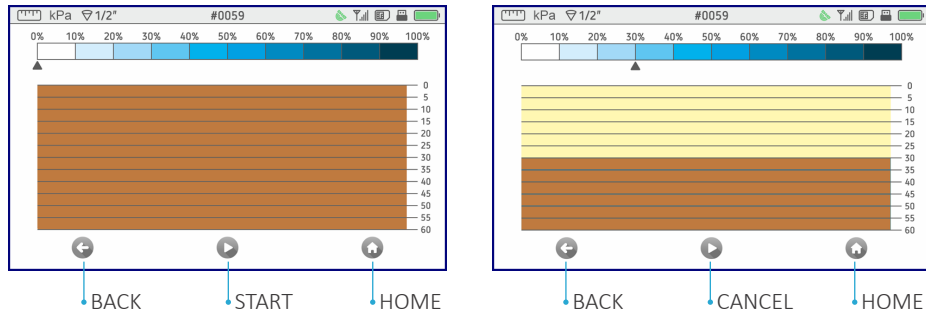


Figure 17

After measuring, a table with fixed measurement results is displayed. Soil moisture measurement data can be viewed also in the form of a graph. Press SAVE to save the measurement, or BACK to return to the main page (Figure 18).

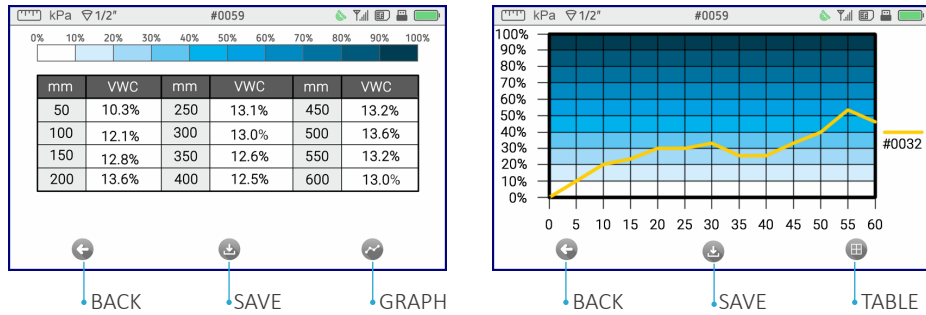


Figure 18

7.5.2. STATIC METHOD

In the case of a static measurement at a certain depth, the depth reference plate is not used. Wait for the signal from the GPS satellite, the satellite icon at the upper right of the display will turn green (Figure 14). Dip the sensor to the desired depth and press START. The measurement process takes about ten seconds. To return to the main page, press HOME or BACK (Figure 19).

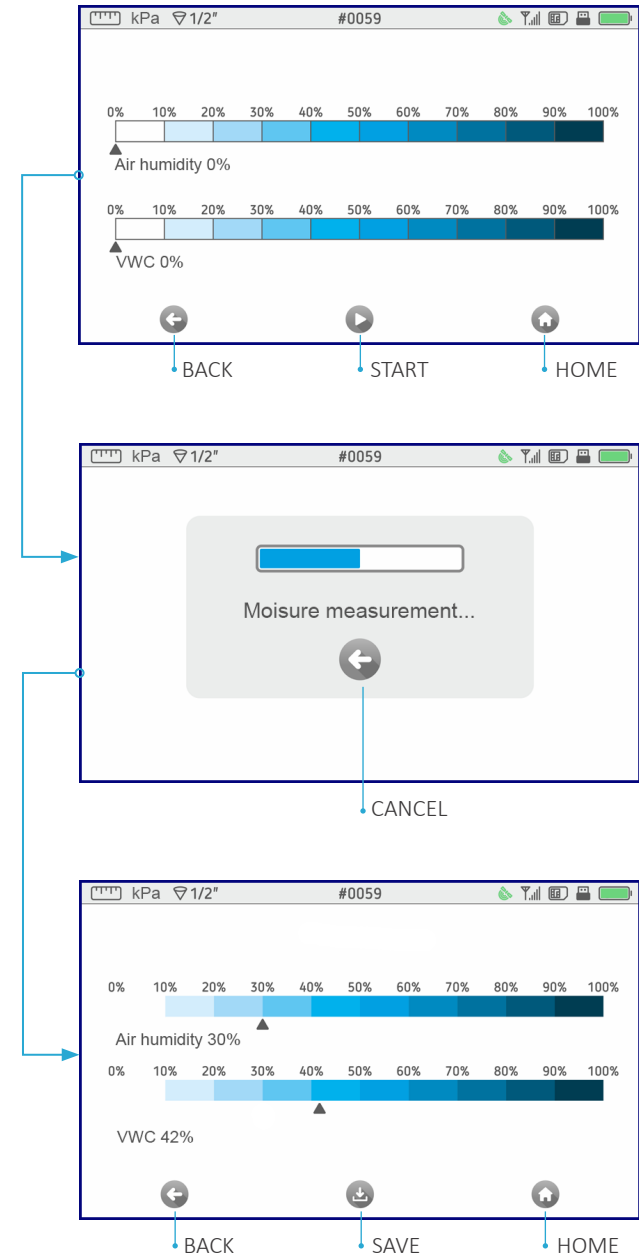


Figure 19

Animation line at the upper of the display shows changes during air humidity measurement, and the animation line at the bottom shows soil moisture measurement changes. Press SAVE to save the measurement.

7.6. TEMPERATURE MEASUREMENTS

Measurement of the air temperature is carried out using the built-in sensor. To measure the temperature of the soil, use an external sensor (see page 4 item 11). Connect the sensor to the penetrometer and press TEMPERATURE on the HOME page. Wait for the signal from the GPS satellite, the satellite icon at the upper right of the display will turn green (Figure 14). Dip the sensor to the desired depth and press START. The measurement process takes about ten seconds. To return to the main page, press HOME or BACK (Figure 20).

Animation line at the upper of the display shows changes during air temperature measurement, and the animation line at the bottom shows soil temperature measurement changes. Press SAVE to save the measurement.

7.7. ELECTRICAL CONDUCTIVITY MEASUREMENTS

To measure the electrical conductivity of the soil, connect the sensor DSM-600 to the device, as indicated in Figure 2. Wait for the signal from the GPS satellite, the satellite icon at the upper right of the display will turn green.

Move down the sensor already connected to the penetrometer with a pointed tip to the plate without pushing it into the ground. Press START and move the sensor to the hole in the middle of the depth reference plate, put press on the penetrometer with the constant speed at right angles to the plate, gradually pushing the measuring part in the ground.

Animation line at the upper of the display shows changes during electrical conductivity of the soil measurement, and the animation line at the bottom shows the penetration depth of the sensor.

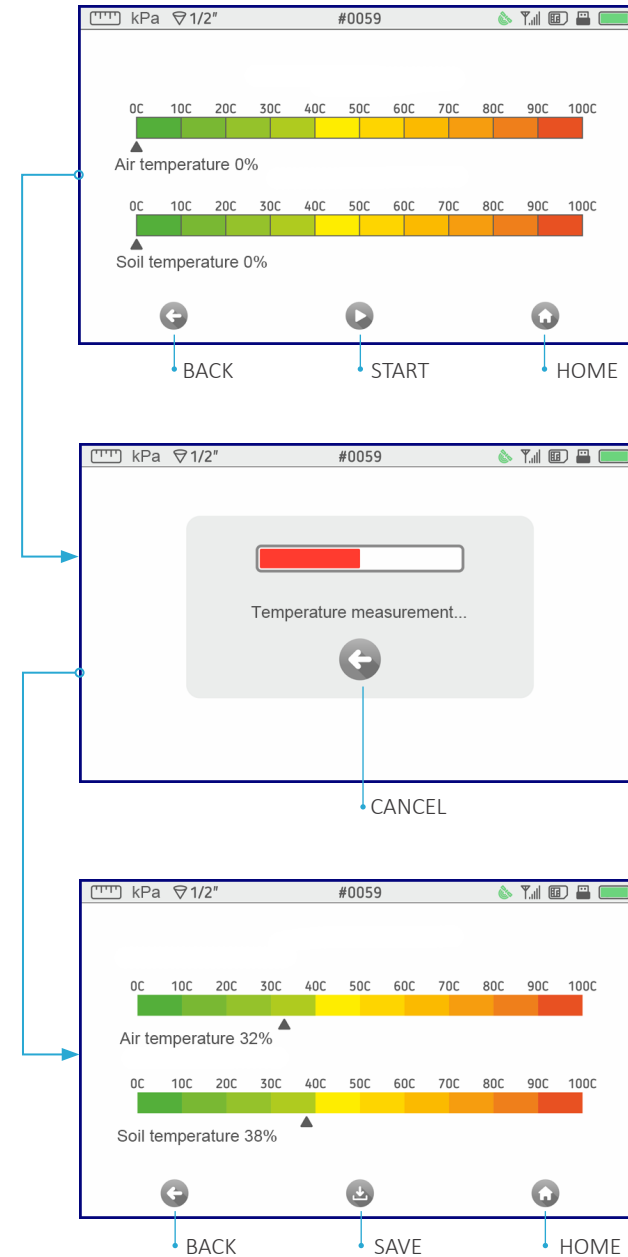


Figure 20

If the process measurement becomes impossible due to the obstacle (solid rock, vegetable residues, etc.), do not try to put more efforts to overcome obstacles. Nevertheless, it is possible to save the results of the measurement at the depth to which the measurement was performed, or press the CANCEL button. To return to the main page, press HOME or BACK (Figure 21).

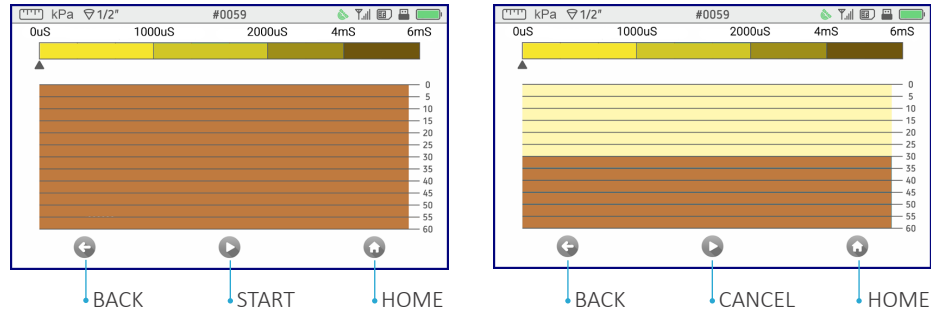


Figure 21

After measuring, a table with fixed measurement results is displayed. Soil moisture measurement data can be viewed also in the form of a graph. Press SAVE to save the measurement, or BACK to return to the main page. Press SAVE to save the measurement, or BACK to return to the main page (Figure 22).

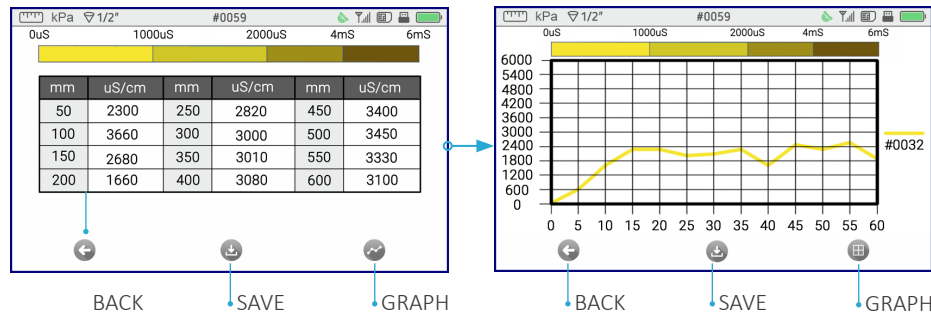


Figure 22

8. DATA SYNCHRONIZATION

The exclamation point on the SYNCHRONIZATION icon means that there are measures and tasks to be sent to the server (Figure 22).

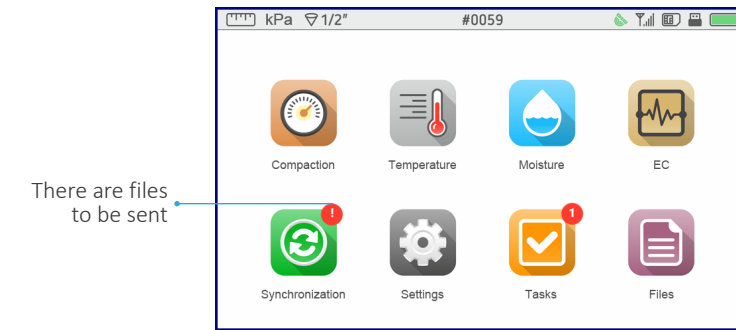


Figure 23

In the internal memory of the device up to 5000 measurements, and up to 100 completed tasks can be stored.

On the main page press SYNCHRONIZATION. SYNCHRONIZATION menu displays the number of unsent files and tasks. Send stored data to the server using GSM connection.

To send the measure packet, make sure the device has a SIM-card and you are in the GSM coverage area. Press the SEND button. The animation line displays the status of the file transfer: the number of transferred and the remaining files (Figures 24 and 25).

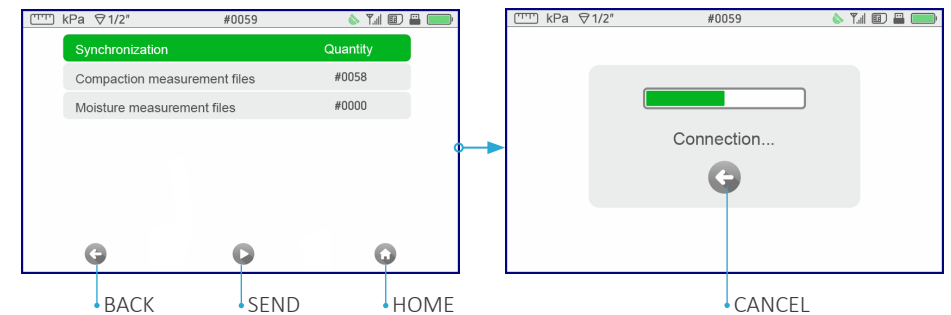


Figure 24

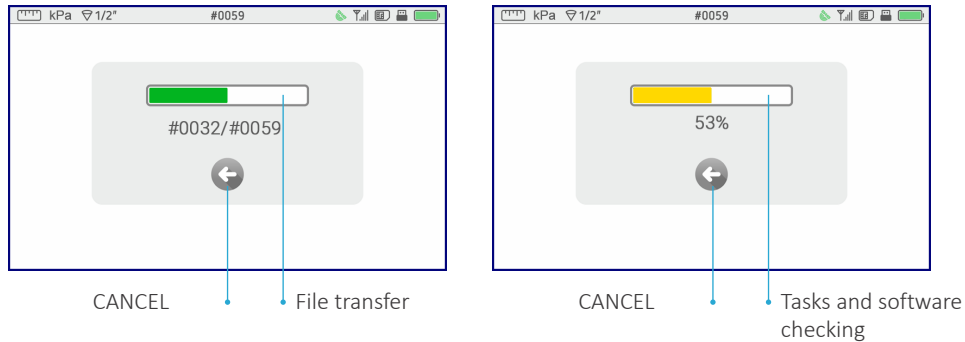


Figure 25

If the data transfer fails, a notification NO NETWORK!/ NETWORK ERROR!/ No SIM CARD! will be displayed on the screen. To resolve the issue, check the availability of GSM connection, and the SIM-card position. Restart the device, check the balance on the SIM-card, or retry the data transfer later (see Appendix).

Send the stored data packet to the server using the AFS software and your PC. Download a special program in your Personal AFS Account, according to your operating system. The program allows you to transfer measurements from device to server for further data processing. You need only:

- save the program to your PC and open it. It does not require additional installation actions;
- connect the device to a PC and synchronize data. During synchronization, measurement data from the device is transferred to the PC, and then immediately to the server.

In the process, there is a possibility to stop sending, press CANCEL. When you cancel data transfer, you return to the SYNCHRONIZATION menu, and the data will be saved on the device.

9. TASKS

In the Personal AFS Account on the field management page, create tasks for soil compaction, electrical conductivity, moisture and temperature measuring. After synchronizing the device with the server, in the TASKS menu you will see new tasks to be performed. The numbers in the red circle on the TASKS icon indicate the number of tasks to be performed (Figure 26).

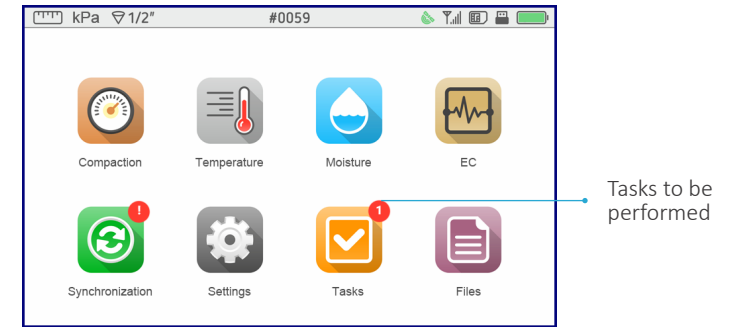


Figure 26

In the internal memory of the device up to 100 tasks to be perform can be stored. On the main page press the TASKS button. TASKS menu displays the number of tasks to be perform, their type and performing time (Figure 27).

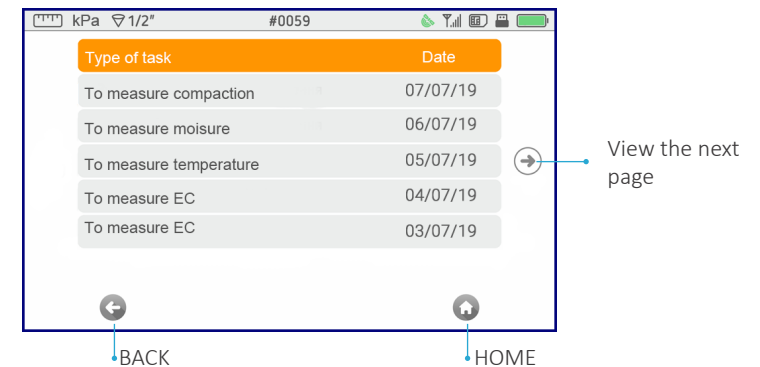


Figure 27

Irrelevant tasks can be removed. Click on an irrelevant task and keep it until the removal form appears (Figure 28).

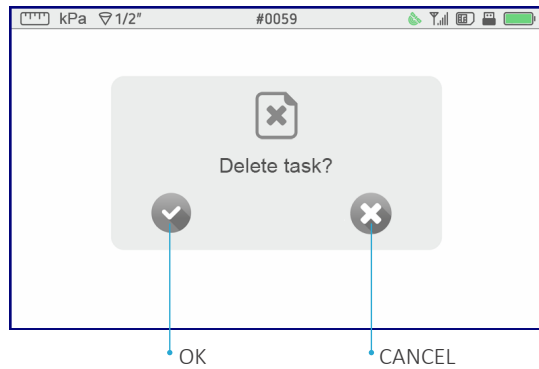


Figure 28

Select the desired task that you need to complete. Wait for the signal from the GPS satellite, the satellite icon at the upper right of the display will turn green (Figure 14). Once the necessary task is selected, the navigation map will be displayed on the screen (Figure 29).

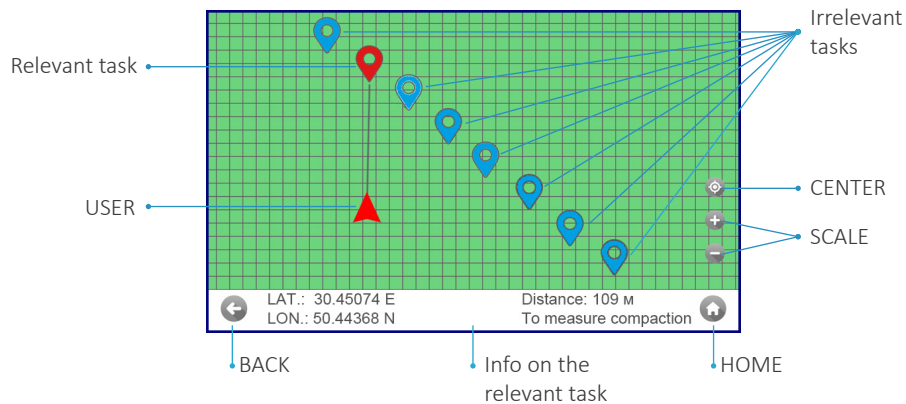


Figure 29

If there is a change in the magnetic field in the area where the tasks are being carried out, an appropriate warning appears asking you to calibrate the compass (Figure 30).

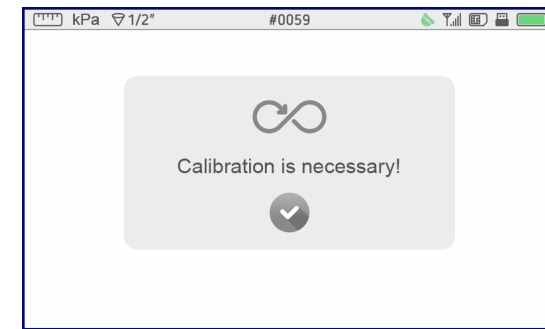


Figure 30

During calibration, a menu appears showing the progress of the calibration on each of the three axes (Figure 31).

To calibrate correctly, disconnect the sensor or the penetrating probe, hold the device with both hands and move the penetrometer a few times as in Figure 32.

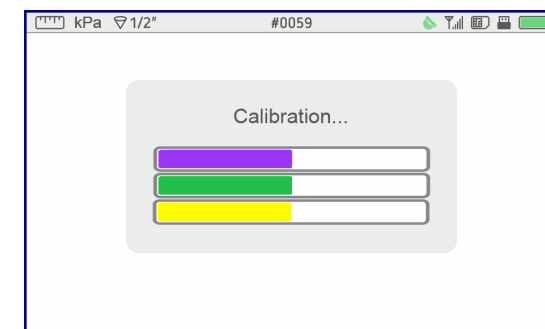


Figure 31

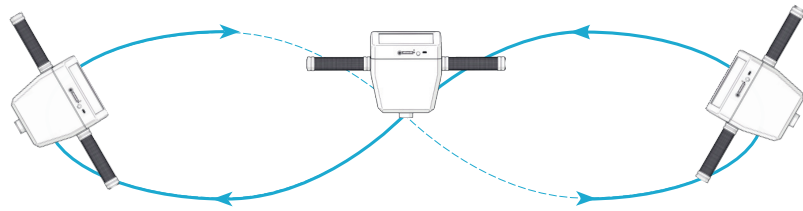


Figure 32

The map shows all the tasks that are next to the user. The task can be re-selected without going back to the previous menu, just click on the desired one. The triangle on the map indicates the user, and the direction of the device. At the bottom of the screen you can see the distance to the point where it is necessary to complete the task and the task type. If necessary, zoom and scroll the map in the required direction to view the tasks. To center the map, press the CENTER button. In the range of tasks (5 meters), the message TASK LOCATION! will appear on the screen (Figure 33).

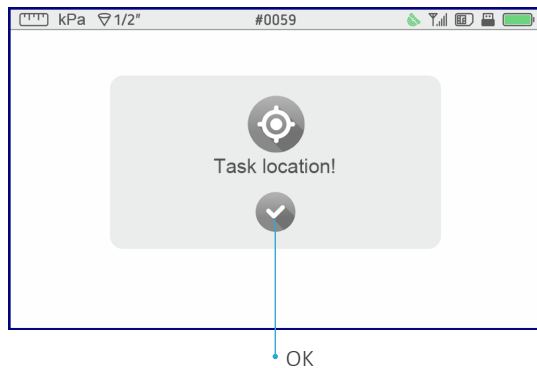


Figure 33

Press OK, the device will automatically switch to the measurements menu according to the selected task type.

10. FILES

FILES menu stores all compaction, moisture, temperature, and electrical conductivity files, their quantity and detailed information: number, measure date and time, and additional information. To return to the main page, press HOME or BACK (Figure 34).

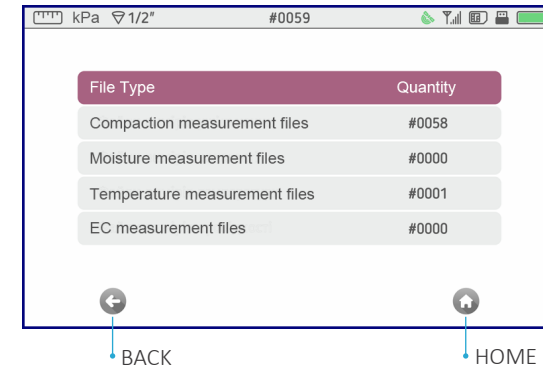


Figure 34

Click on one of the files to access the selected file type menu (Figure 35).



Figure 35

Click on the measurement for detailed information: date and time, cone type (for compaction), exact coordinates of this measure (Figure 36). Display of data is possible in a table or graph (Figure 37).

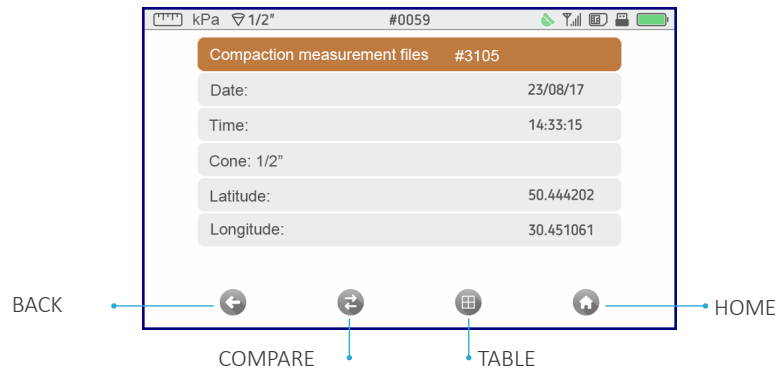


Figure 36

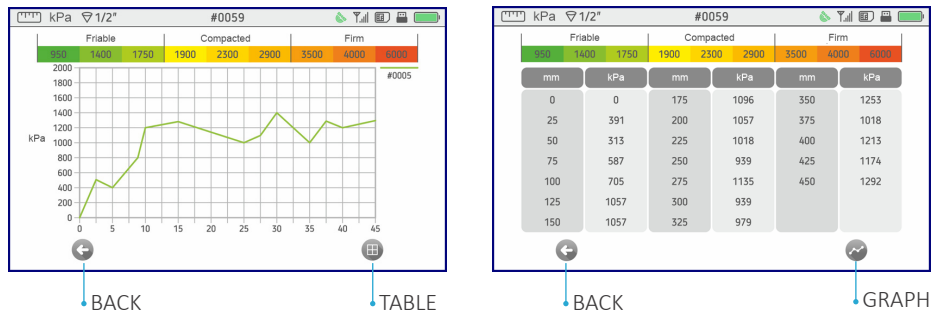


Figure 37

To compare the selected measurement with other measurements of the same type, press COMPARE (This option is available for compaction measurements, electrical conductivity, soil moisture measurements in the dynamic measurement mode). After clicking on COMPARE a map is displayed with the selected measurement (it is highlighted in red and detailed information will be displayed at the bottom of the screen) and measurements of the same type that are located 500 m from the selected measurement for comparison. Use the + and - buttons to resize the map, see the other measurements within a certain radius. To change the measurement of the comparison, click on a different measurement. Press CENTER button to center the displayed measurements according to the selected measurement. Select the second measurement for comparison (highlighted in red) and press the COMPARE (Figure 38).

Comparison of compaction measurements

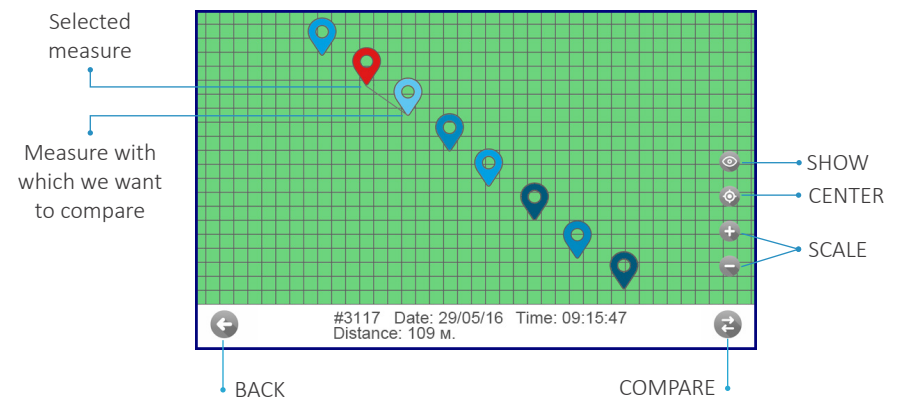
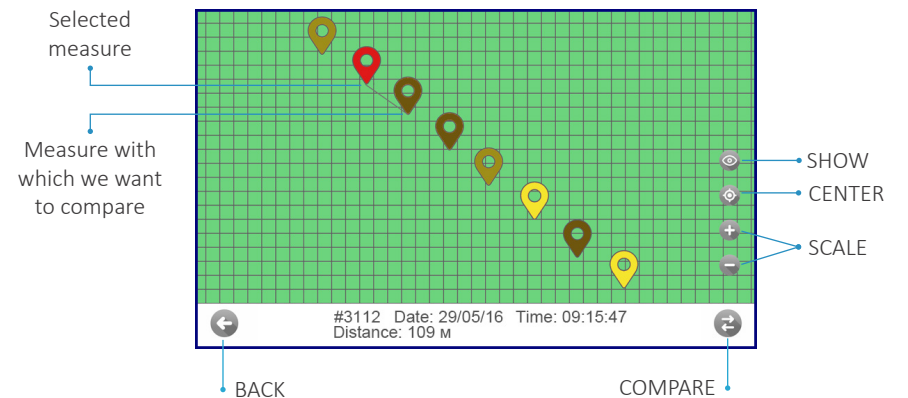
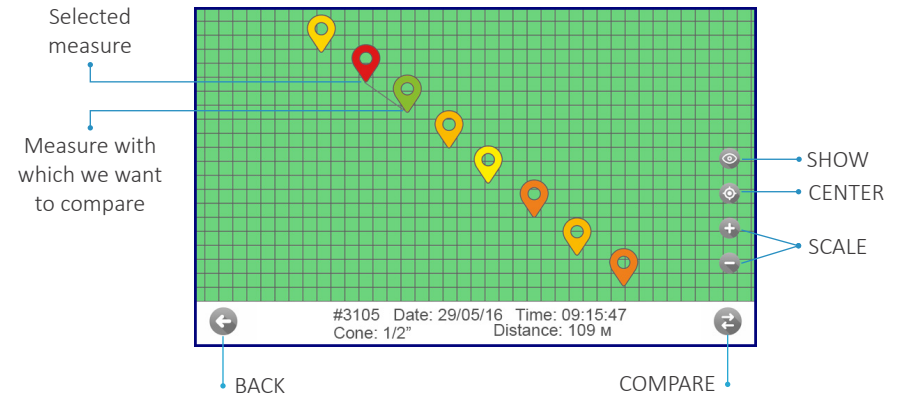


Figure 38

When you press the COMPARE button, the device displays two measurements on one graph for comparison (Figure 39).

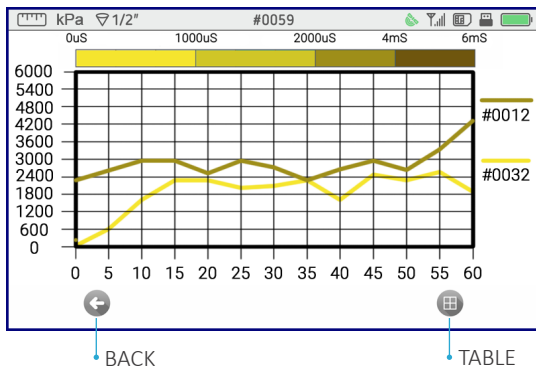
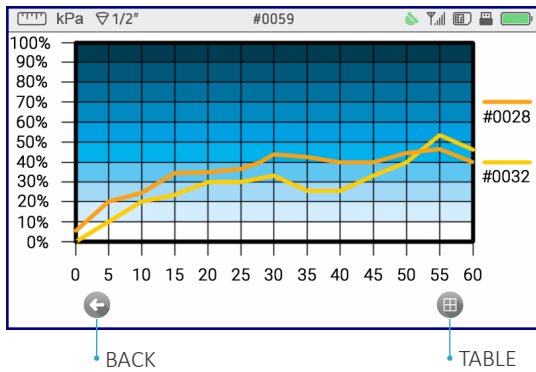
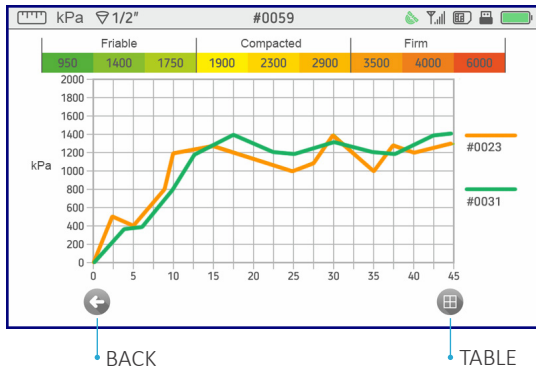


Figure 39

You can compare the selected measurements in the table by clicking on the TABLE button (Figure 40).

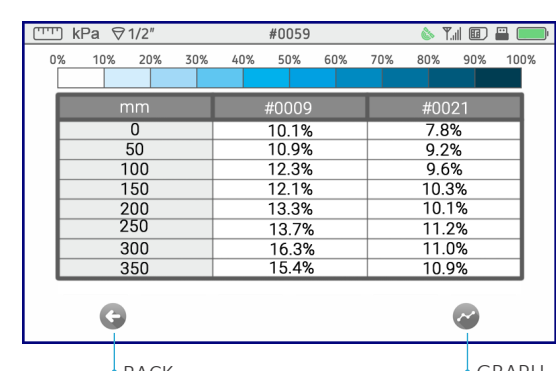
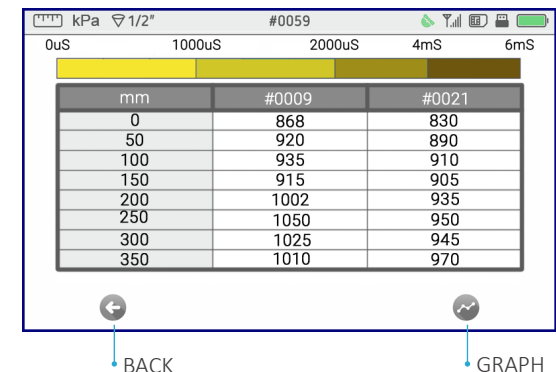
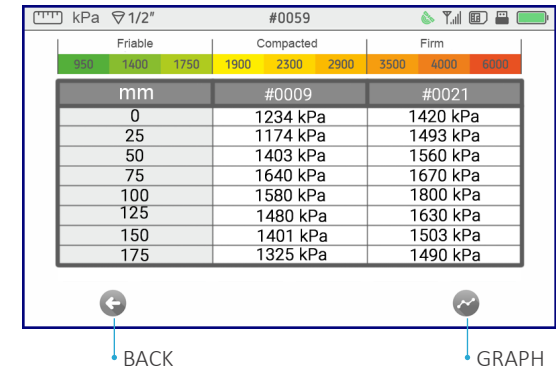
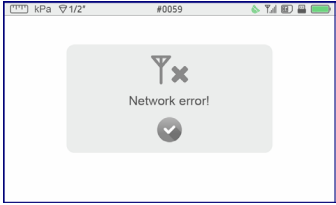

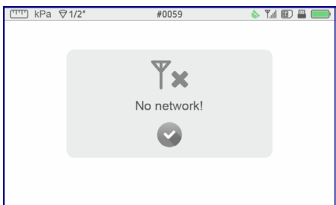
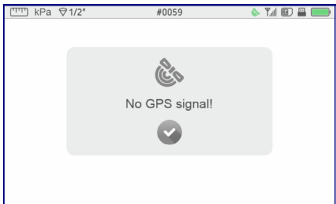


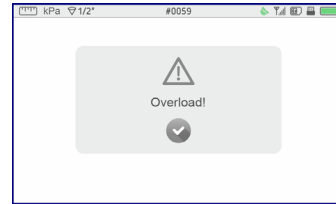


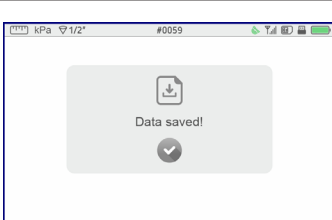
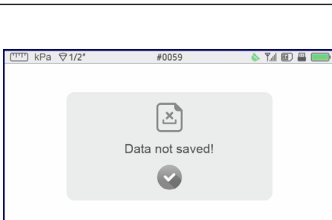
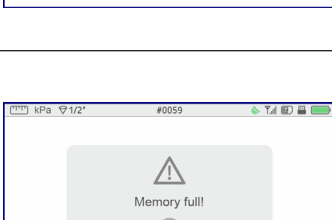


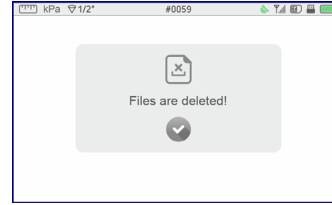
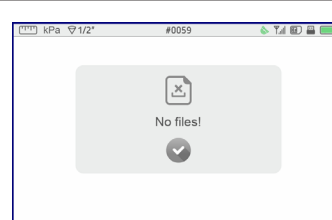
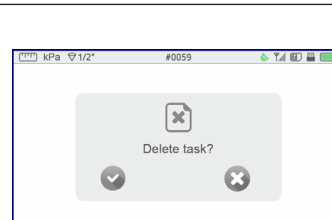
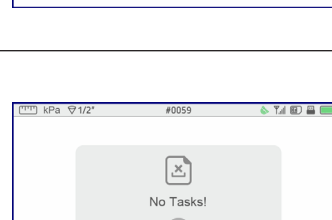
Figure 40

APPENDIX

Notification	Comment
	<p>Network error! The network in this region is temporarily overloaded or there are no funds on the phone account.</p>
	<p>Server error! There was a connecting problem. Try to reconnect.</p>
	<p>No network! There is no GSM connection, or not enough money in phone account. A notification is displayed when trying to send data to the server. Check the status of the GSM connection and the position of the SIM card. Restart the device. Please try sending again after eliminating possible errors.</p>
	<p>No GPS signal! Missing GPS connection due to weak signal. A notification appears when trying to start a measurement. Go to the open area and wait for steady signal with the satellite.</p>

Notification	Comment
	<p>Low battery level! Low battery level, charge the device.</p>
	<p>Too fast! The measurement was performed too fast, it is necessary to make one more measure as close as possible to the previous but not less than 10 cm.</p>
	<p>Overload! Maximum load weight exceeded. It is necessary to stop the measurement immediately, it may cause damage to the device or some of its parts.</p>
	<p>Sensor not connected! Check the connection of the sensor or the presence of mechanical damage in the connection area.</p>

Notification	Comment
	Data saving... There is a file saving.
	Data saved! The file has been saved effectively.
	Data not saved! An error while saving files. Restart the device and repeat the action.
	Memory full! The device memory is full, delete data. Before deleting, make sure that the data has been sent to the server.

Notification	Comment
	Files are deleted! Selected files were deleted.
	No files! There are no files of the selected category on the device.
	Delete task? Removing irrelevant task. If the removal was chosen accidentally, click «No».
	No Tasks! There are no tasks on the device. Go to the sync menu and check if there are any tasks.

Notification	Comment
<p>A screenshot of a mobile application interface showing a notification box with a PC icon and the text "Connected to PC!" and a checkmark.</p>	<p>Connected to PC! The device is connected to PC.</p>
<p>A screenshot of a mobile application interface showing a notification box with the text "Synchronization with PC!" and three circular progress indicators.</p>	<p>Synchronization with PC! The device is connected to the PC, and the program for data synchronization is running on the PC.</p>
<p>A screenshot of a mobile application interface showing a notification box with a SIM card icon and the text "No SIM Card!" and a checkmark.</p>	<p>No SIM Card! The SIM card was not detected while trying to send the measurements, the data will not be sent to the server, but saved on the device. Insert the SIM card or make sure it is properly installed.</p>
<p>A screenshot of a mobile application interface showing a notification box with a warning triangle icon and the text "Please, contact the service centre!" and a checkmark.</p>	<p>Please, contact the service center! The system of self-diagnostics of the device revealed an internal error.</p>

Notification	Comment
<p>A screenshot of a mobile application interface showing a notification box with the text "Calibration..." and three horizontal progress bars in purple, green, and yellow.</p>	<p>Calibration... A process of the compass calibration, do everything in accordance with the instruction (Figure 32).</p>
<p>A screenshot of a mobile application interface showing a notification box with a warning triangle icon and the text "The compass was calibrated!" and a checkmark.</p>	<p>The compass was calibrated! The compass was calibrated and ready to work.</p>