FAKOPP

Manual for
Root Detector

2019.03.26.

Introduction

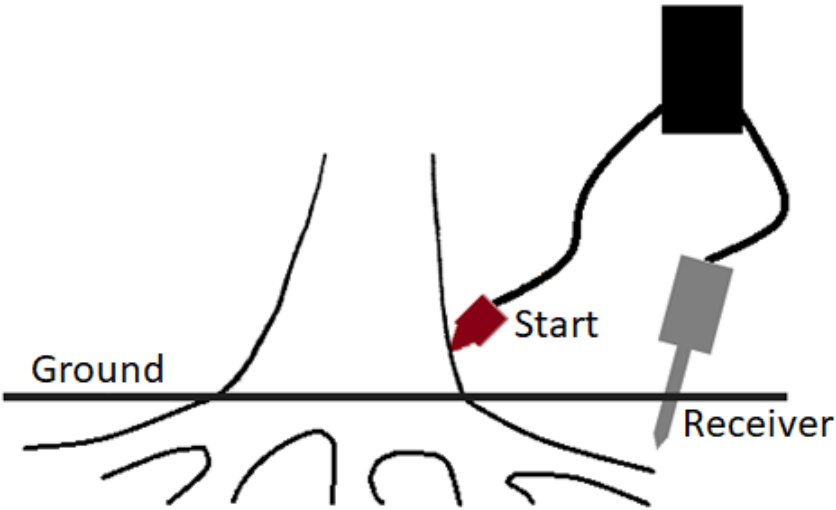
Welcome as a new Root Detector owner. Root Detector is designed to find the bigger roots of a tree detected by a non-destructive acoustic method.

Manufacturer information

Root Detector is manufactured by:

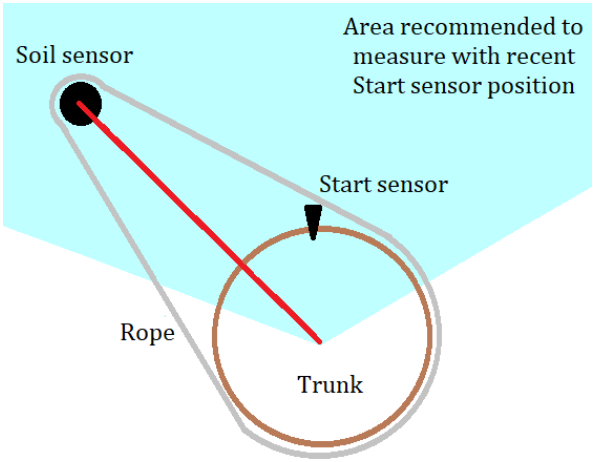
Company:	Fakopp Enterprise Bt.
EU tax number:	HU22207573
Address:	Fenyo 26.
City:	Agfalva
ZIP:	9423
Country:	Hungary
Web:	http://www.fakopp.com
E-mail:	office@fakopp.com
Phone:	+36 30 39 49 562

Principle of operation



A sound signal is generated on the root collar. It travels fast in the wood material but slows down in soil. The time is measured between the start and the receiver sensor. The distance between the start and receiver sensors are measured and sound velocity is calculated. Increase of the sound velocity indicates the presence of a root.
The start sensor is placed on the root collar of a tree facing to the ground in an angle about 45°. The soil sensor is placed and replaced around the tree. The start sensor is hit by 100g weight hammer – starting the time measurement. The sound signal travels in the tree and in the soil. As the signal reaches the soil sensor, the time measurement stops, and the measured µs-s are sent to the computer.

The angle between the start and receiver sensors should not exceed 90°. The recommended maximum angle is 60°. So, it is recommended to replace the start sensor twice during measuring around a tree.

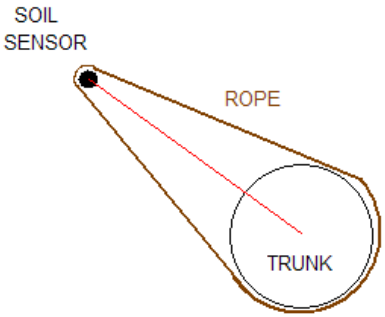


Package content

Start sensor (with 6m cable)
Soil sensor
Dual amplifier box
Battery box
Rubber hammer
Steel hammer
Evaluation software
Rope
Software

Hardware setup

1. Put the rectangular long-cable sensor on the tree. The spike should point towards the roots in about 45°.
2. Connect the BNC connector to the (ArborSonic) amplifier (black) box.
3. The soil sensor (cylindrical) should be connected to the amplifier box also.
4. Connect the battery box to the amplifier box using the link cable.
5. Knot a loose rope around the tree. The rope will help you keep constant distance between the tree and soil sensor. Measure the radius of circle (the distance shown here as the red line). As you move the soil sensor the distance will be the same this way.



6. We recommend you place the starting position to the northern side of the trunk.

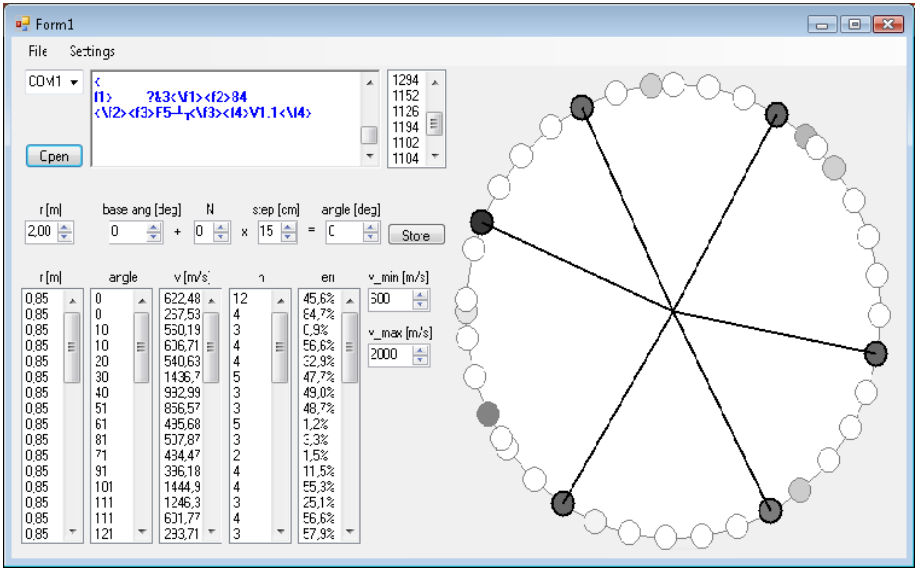
Root detector setup.

Software setup

Installation: copy the files to your hard drive.

You will need to install .NET 4.0:
http://www.microsoft.com/en-us/download/details.aspx?id=17851

Start the software and you will see the following window:



Turn on the battery box.

1. Select the appropriate COM port. You can use the ArborSonic manual in case you have a problem with Bluetooth pairing. You must use the same port as in ArborSonic.

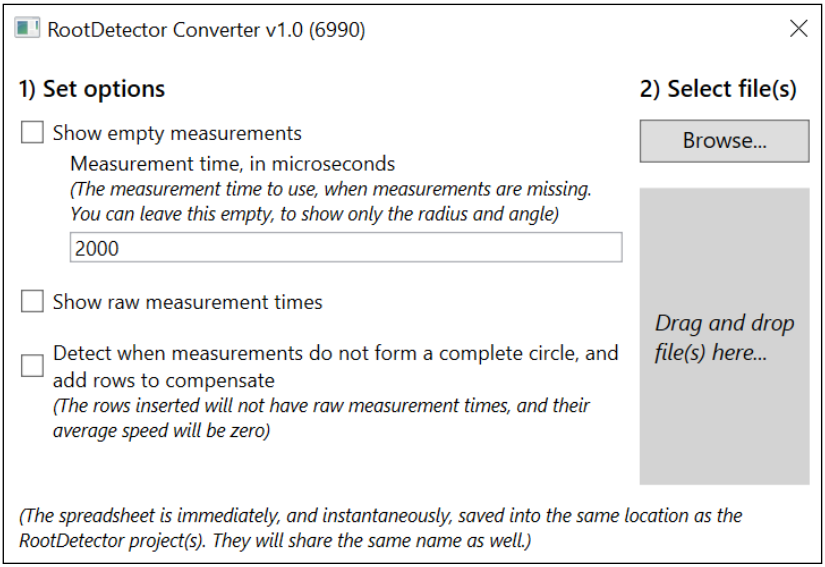
2. Open the port by clicking “Open”.
3. The blue characters in the window represent raw input data. You don’t need to worry about it.
4. Hit the sensor placed on the tree using the 100 g hammer (part of the ArborSonic package).
5. The measured data will be shown right to the raw field (blue characters).
6. Set the radius (red line on the hardware setup)
7. Base ang(le) is recommended to be 0 degrees
8. Recommended value for Step is 15 cm.
9. After 3 hits (3 valid data), press the “Store” button. More hits don’t cause a problem.
10. Increment N and move the sensor by the distance given by the “Step” value in clockwise direction.
11. Hit again and repeat the steps 5-11 as you circle the tree.
12. At the end of the measurements chose “Save” from the “File” menu.

Data will be shown in the lower left side of the window. According to measured velocities, the colors of the small circles representing the measurement points will change. Darker points represent higher velocity which indicates the presence of a root. The system is capable of detecting roots 30-40 cm below the surface.

Generating graphs in Excel from .rdm files

RootDetectorConverter is a software which can convert .rdm files into .xlsx, Microsoft Excel files. It can be a handy tool for making graphs.

The software is available on the fakopp.com homepage in a .zip file. If you would like to use it, please download and unzip the content to a proper folder.
Start the RootDetectorConverter.exe.



RootDetectorConverter

Here you can decide if you would like the program to fill missing data, show raw measurements (not only the averages of the measured times at a proper position) and/or adding rows to complete a circle (making zero valued rows till reaching 360 degrees).

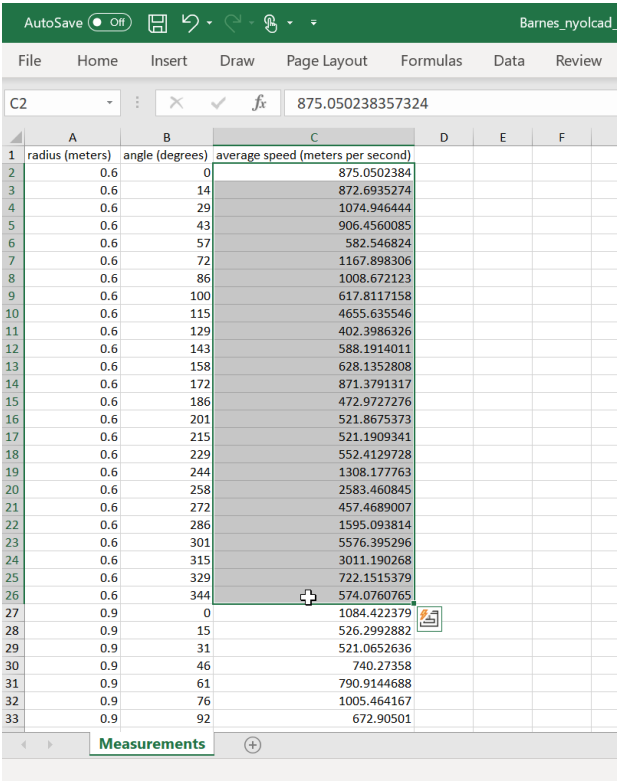
On the right side of the window you can Browse your computer or drives for files or you can just drag and drop the files onto the grey area.

The .xlsx file will be made immediately (it should not take more than a few seconds) and they will appear in the folder of the original file, named after the original file.

Step by step guide to make radial graphs is Excel

1.) During the measurement do NOT push "Store" all the time. Push store ONLY after you finished at one position. Push "Store" only once at a position.
2.) Measure step by step if it is not absolute necessary do not move back and forth. Save the data after the measurement.
3.) Drop the .rdm file to the converter software.
4.) Open the .xlsx file in excel. There should be columns like radius (meters), angle (degrees) and average speed (meters per second).

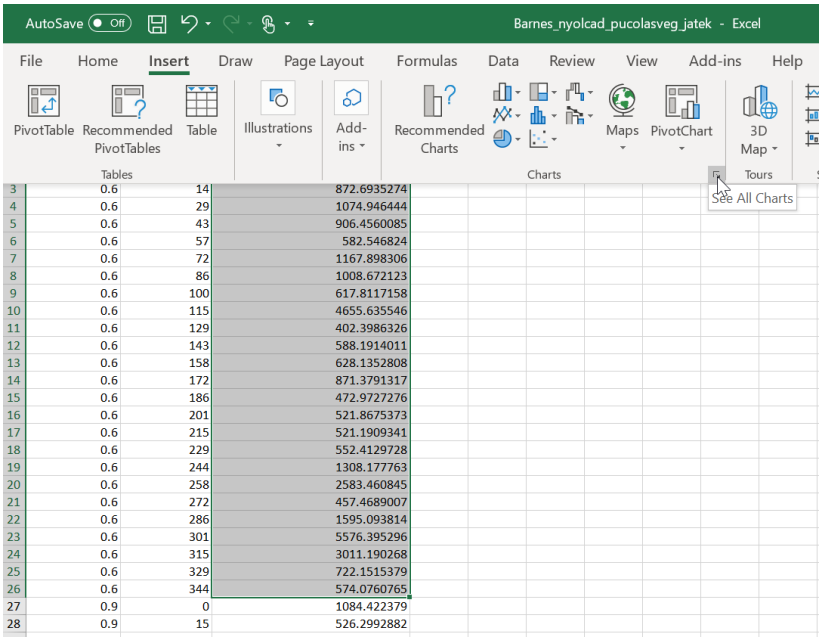
5.) Mark average speed data for a radius.



	A	B	C	D	E	F
1	radius (meters)	angle (degrees)	average speed (meters per second)			
2	0.6	0	875.0502384			
3	0.6	14	872.6935274			
4	0.6	29	1074.946444			
5	0.6	43	906.4560085			
6	0.6	57	582.546824			
7	0.6	72	1167.898306			
8	0.6	86	1008.672123			
9	0.6	100	617.8117158			
10	0.6	115	4655.635546			
11	0.6	129	402.3986326			
12	0.6	143	588.1914011			
13	0.6	158	628.1352808			
14	0.6	172	871.3791317			
15	0.6	186	472.9727276			
16	0.6	201	521.8675373			
17	0.6	215	521.1909341			
18	0.6	229	552.4129728			
19	0.6	244	1308.177763			
20	0.6	258	2583.460845			
21	0.6	272	457.4689007			
22	0.6	286	1595.093814			
23	0.6	301	5576.395296			
24	0.6	315	3011.190268			
25	0.6	329	722.1515379			
26	0.6	344	574.0760765			
27	0.9	0	1084.422379			
28	0.9	15	526.2992882			
29	0.9	31	521.0652636			
30	0.9	46	740.27358			
31	0.9	61	790.9144688			
32	0.9	76	1005.464167			
33	0.9	92	672.90501			

Measurements

6.) Go to Insert tab and See All Charts.



3	0.6	14	872.6935274
4	0.6	29	1074.946444
5	0.6	43	906.4560085
6	0.6	57	582.546824
7	0.6	72	1167.898306
8	0.6	86	1008.672123
9	0.6	100	617.8117158
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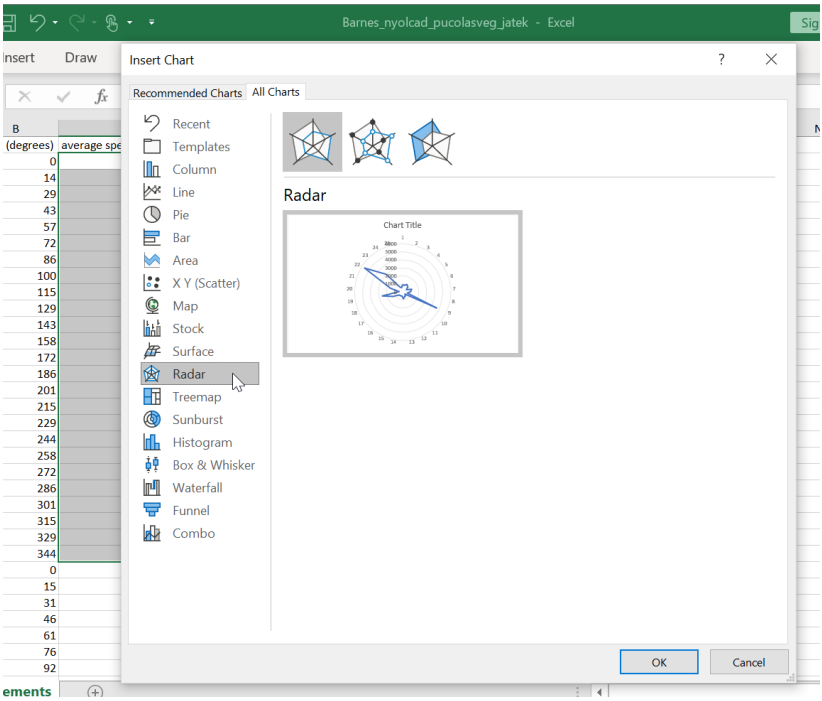
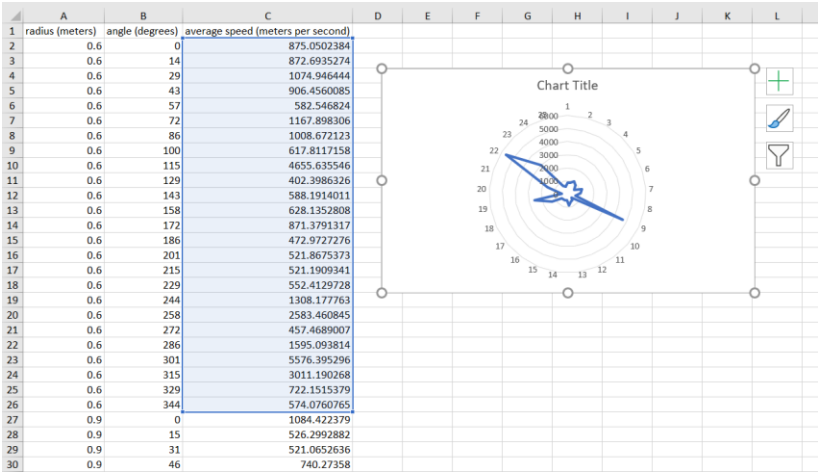
23	0.6	301	5576.395296
24	0.6	315	3011.190268
25	0.6	329	722.1515379
26	0.6	344	574.0760765
27	0.9	0	1084.422379
28	0.9	15	526.2992882

7.) Go to All Charts and Radar.



8.) Insert the radar chart.



	A	B	C
1	radius (meters)	angle (degrees)	average speed (meters per second)
2	0.6	0	875.0502384
3	0.6	14	872.6935274
4	0.6	29	1074.946444
5	0.6	43	906.4560085
6	0.6	57	582.546824
7	0.6	72	1167.898306
8	0.6	86	1008.672123
9	0.6	100	617.8117158
10	0.6	115	4655.635546
11	0.6	129	402.3986326
12	0.6	143	588.1914011
13	0.6	158	628.1352808
14	0.6	172	871.3791317
15	0.6	186	472.9727276
16	0.6	201	521.8675373
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18	0.6	229	552.4129728
19	0.6	244	1308.177763
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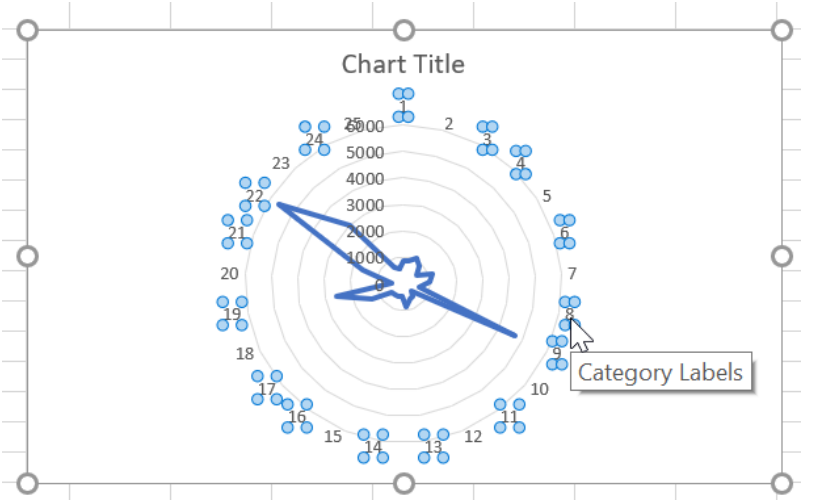
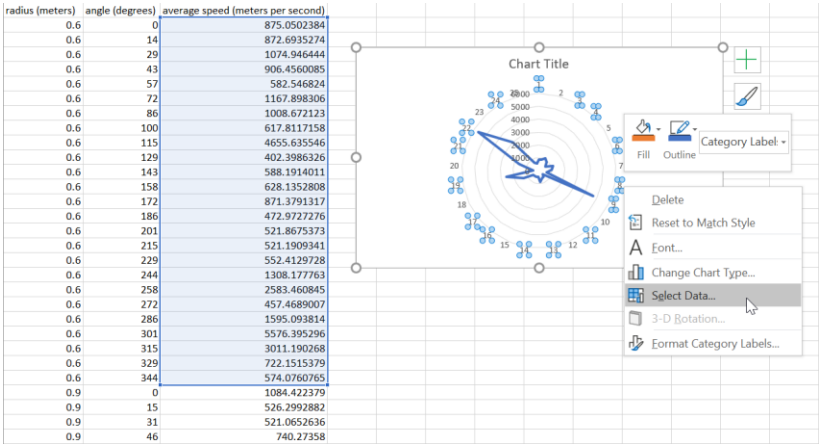
23	0.6	301	5576.395296
24	0.6	315	3011.190268
25	0.6	329	722.1515379
26	0.6	344	574.0760765
27	0.9	0	1084.422379
28	0.9	15	526.2992882
29	0.9	31	521.0652636
30	0.9	46	740.27358

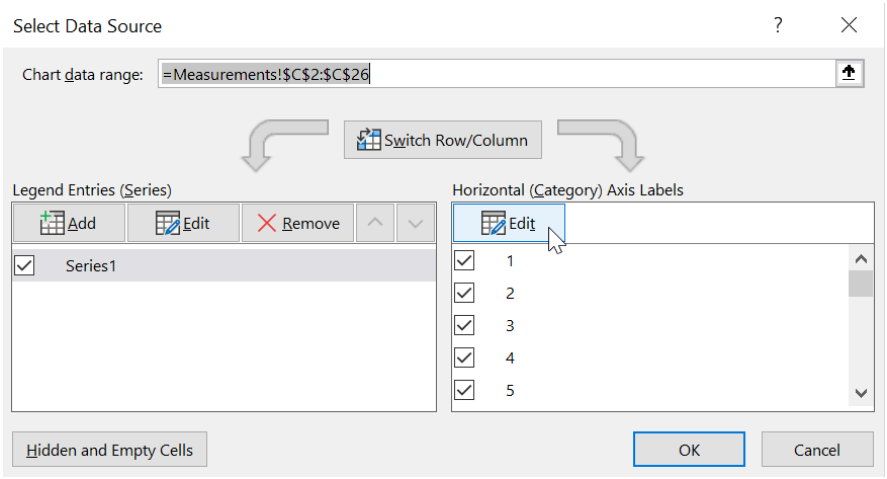
9.) Select the category labels.



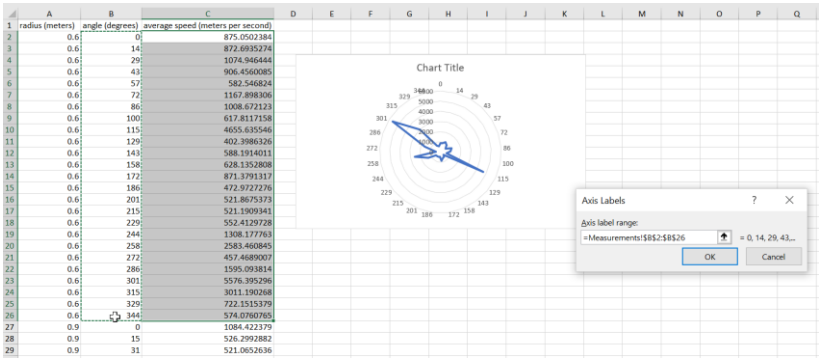
10.) Click with right mouse button and select "Select Data..."



11.) Click "Edit".



12.) Select the proper angle data. (See pic08.)



13.) Push Ok and Ok, and your graph is ready.
14.) Repeat if you need graphs from another radius.

Maintenance

Keep the device in a dry place in room temperature.

If you have to clean it, please use a lightly wet towel.

If resin got to the sensors you can clean them with benzine. Take care of the handling of the chemical.

If any of the parts are broken please contact us.

It is recommended to switch off the device after measurement.

Do not break the cables and keep them coiled up to avoid tangle.

Guarantee

The guarantee lasts for one year from the arrival of the device.

Important note

The root detector device will find the main roots and will find them if there is enough wood to let the sound signal on. This test can not differ between damaged and non-damaged roots. No data on root system stability or safety will be provided.