FS Future Series

3D Ground Navigator

Version 1.0

User's Manual

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Chapter 1

Introduction

1.1 Preface

Dear customer,

all of the engineers, sales, training and support staff at OKM GmbH would like to thank you for your purchase of the 3D Ground Navigator.

The 3D Ground Navigator detector works on the principle of Electro-Magnetic Signature Reading (EMSR). Besides the detection of metallic objects this device is also capable of detecting natural features of the earth like formations of strata, cavities, voids, faults, ground water and other non-metallic objects. Then of course this equipment is best suited at detecting sepulchers, treasure, buried utilities, tanks and the like.

The 3D Ground Navigator is able to locate, document and analyze buried objects within various structures and vessels non-intrusively without having to excavate the area. Using EMSR is particularly useful in areas where detection is a must and excavation is not possible. The facile and flexible handling of the 3D Ground Navigator can easily and quickly give reproducible results.

With our team of specialists we guarantee that our products are under recurrent control. Our specialists try to implement new developments in terms of further quality improvements for you.

By purchasing or using one of our products, we cannot guarantee that during the course of your research that you will be successful and have a find. The recognition of hidden and buried objects depends on a huge number of factors. As you well may know there are different soil types all over the world with different levels of natural attenuation. Variable soil properties can and will hamper and alter ultimate scan measurements. Areas where there is an extreme amount of ground water, varying clays, sands and wet soils making scanning more difficult and may reduce the maximum depth capabilities of any and all detection equipment, regardless of make or model.

For more information regarding where this equipment has been used and operated, please visit our web site. Our equipment is constantly being tested and when improvements or upgrades are available, we will list them also on our web site.

It is necessary for our company to protect our developments and all of the information learned during the “Research and Development” phases in creating our technology. We strive to stay within the given framework of legislation, patents and trademark registration.

Please take your time to read this User Manual and familiarize yourself with the operation, functionality and how to utilize the 3D Ground Navigator. We also offer training for your equipment in our factory and on-site. We strive to maintain worldwide dealer network for assistance and support. Please visit our web site for more information.

1.2 Important Notes

Prior to using the 3D Ground Navigator and its accessories, please read these operating instructions carefully. These instructions give information on how to use the detector and potential sources where precautions should be taken.

The 3D Ground Navigator and its accessories serve for the analysis, documentation and detection of sub-surface anomalies and ground disturbances. The recorded data of the ground structure will be transmitted to a PC to give a visual representation using our proprietary software program. Any additional notes to the software should be observed. Please read the user manual of the software!

1.2.1 General Notes

Being an electronic device, the 3D Ground Navigator has to be treated with caution and treated with care as with any electronic device. Any failure to observe the safety precautions given or any use for purposes other than the ones it is designed for may result in damage or destruction of the processing unit and/or its accessories or connected components.

The device has a built in anti-tampering module which will destroy the unit if it is improperly opened. There are no end user serviceable parts on the inside of the unit.

1.2.2 Possible Health Hazards

If used properly this device normally does not pose any health hazards. According to current scientific knowledge, the high-frequency signals are not harmful to the human body on account of their low power.

1.2.3 Surrounding Area

When moving this unit from a cold place to a warmer place, watch out for condensation. Do not immediately operate the unit until any possible condensation could have evaporated. The unit is not weather proof and water or condensation can destroy the unit.

Avoid strong magnetic fields, which may occur in places where there are large electric motors or unshielded loudspeakers. Try to avoid using this equipment within 50 meters (150 ft) of this type of equipment.

Metallic objects on the ground such as cans, tin, nails, screws or debris can influence your scan data and present negative results regarding your scan data. Also it is a good habit to remove any metallic objects off of your person like cellular telephones, keys, jewelry, etc... Do not wear steel toe boots.

1.2.4 Voltage

The power supply should not be outside the indicated range of values. Use only approved chargers, batteries and rechargeable batteries which are included in the scope of delivery.

Never use the 115/230 Volt mains supply.

1.2.5 Data safety

Data errors can occur if:

- the range of the sender module has been exceeded,
- the power supply of the device or the batteries are too low,
- the cables are too long,
- the unit is operating to close to devices which sends out disturbances or
- atmospheric conditions (electrical storms, lightning, etc...).

1.3 Maintenance and Services

In this section you will learn how to maintain your measuring instrument with all included accessories to keep it in good condition a long time and to get good measuring results.

The following list indicates what you absolutely should avoid:

- penetrating water
- strong dirt and dust deposits
- hard impacts
- strong magnetic fields
- high and long lasting heat effect

To clean your device please use a dry soft rag. To avoid any damage you should transport the device and accessories always in the appropriate carrying cases.

Prior to using your 3D Ground Navigator please be sure that all batteries and accumulators are fully charged. Also allow the batteries to completely discharge before recharging them, regardless if you are working with the external battery or with internal accumulators. This way your batteries will have a long and durable life.

> To charge the external and internal batteries, use only the approved chargers which are part of our scope of delivery.

1.4 Danger of Explosion during Excavation

Unfortunately, the last two world wars also made the ground in many places of the world a potentially explosive scrap heap. A host of those lethal relics are still buried in the ground. Do not start digging and hacking for an object wildly when you receive a signal of a piece of metal from your device. Firstly, you might indeed cause irreparable damage to a truly rare find, and secondly, there is a chance that the object reacts in an insulted way and strikes back.

Note the color of the ground close to the surface. A red or reddish color of the ground is an indicator of rust traces. As regards the finds themselves, you should definitely pay attention to their shape. Curved

or round objects should be a sign of alarm, especially if buttons, rings or little pegs can be identified or felt. The same applies to recognizable ammunition or bullets and shells. Leave that stuff where it is, do not touch anything and, most importantly, do not take any of it home with you. The killing machines of war made use of diabolical inventions such as rocker fuses, acid fuses and ball fuses. Those components have been rusting away in the course of time, and the slightest movement may cause parts of them to break and be triggered. Even seemingly harmless objects such as cartridges or large ammunition are anything but that. Explosives may have become crystalline over time, that is, sugar-like crystals have formed.

Moving such an object may cause those crystals to produce friction, leading to an explosion. If you come across such relics, mark the place and do not fail to report the find to the police. Such objects always pose a danger to the life of hikers, walkers, farmers, children and animals.

Chapter 2

Install/Uninstall USB drivers on Windows

In this chapter you will learn how to install the USB drivers, that are necessary to transfer data from the machine to your computer software. Please make sure to read the proper section appropriate to your Windows operating system.

2.1 Windows XP

The instructions in this section are only valid for Windows XP.

2.1.1 Install USB drivers on Windows XP

The installation of the USB drivers in Windows XP is relatively simple. After you have connected the device with your computer, switch it on and the message from figure 2.11 appears on your screen.

Figure 2.1: Install USB drivers: Windows XP, Step 1

If your Windows XP has Service Pack 2 installed, you will see the dialog from figure 2.2 if Windows Update has to search for drivers up to date. Mark entry *"No, not this time"* and click on *Next*.

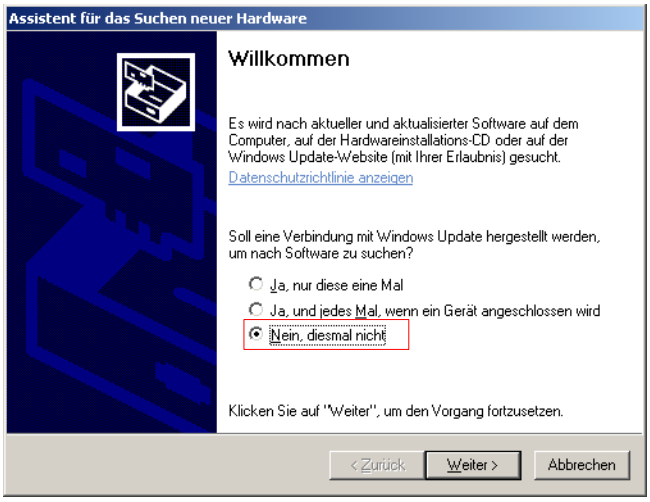


Figure 2.2: Install USB drivers: Windows XP, Step 2

In other versions of Windows this window should not appear.

In the following dialog window like figure 2.3 select the entry *"Install software from a list ..."* and click *Next.*

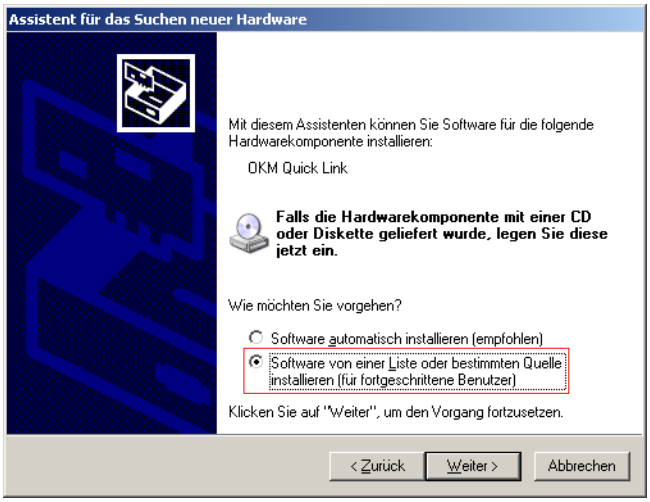


Figure 2.3: Install USB drivers: Windows XP, Step 3

In the next dialog window from figure 2.4 mark the entry No search, select driver individually and click on Next.

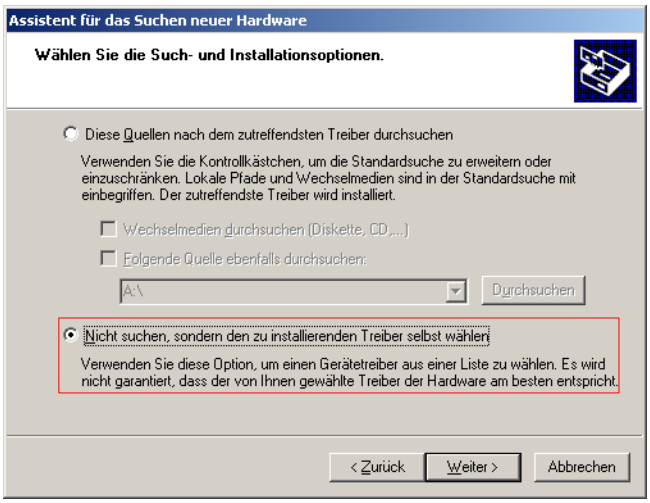


Figure 2.4: Install USB drivers: Windows XP, Step 4

Another window will open, represented in figure 2.5, where you have to select the driver file. Therefore click on Data carrier. ... Immediately another window appears where you click on the button Search ... Then select the file **`OKM_LE.INF`**, which you can find in the directory **`\drivers\usb_cable`** of your software CD. Afterwards you have to click on Open, OK and Next, to start the installation of the files.

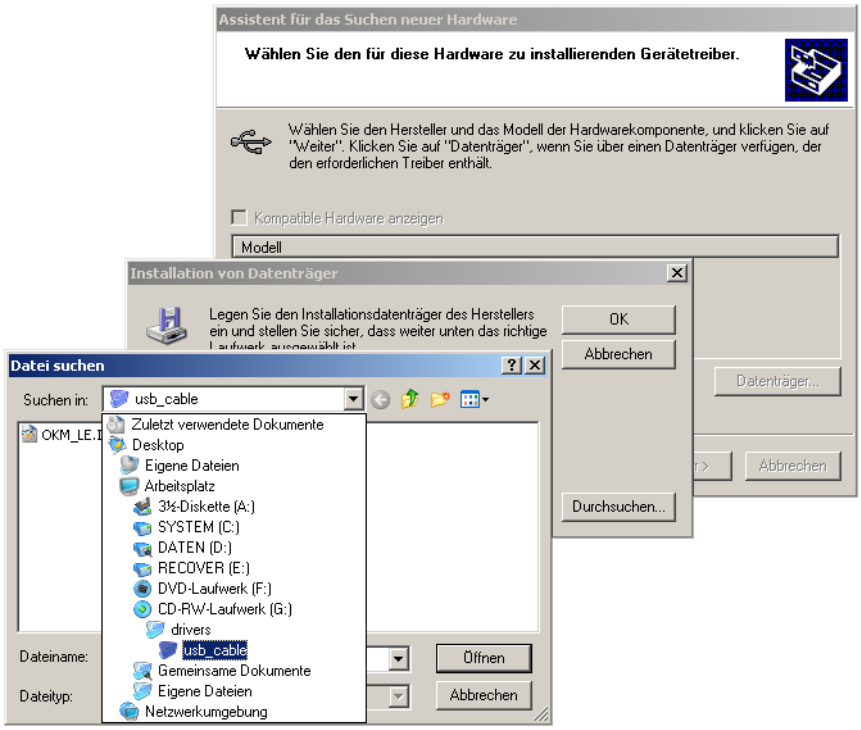


Figure 2.5: Install USB drivers: Windows XP, Step 5

After successful installation of the driver a message like in figure 2.6 will appear on your computer screen. Now the drivers of your device are installed and you can transfer data to your PC.

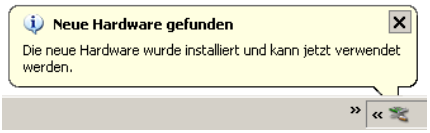


Figure 2.6: Install USB drivers: Windows XP, Step 6

2.1.2 Uninstall USB drivers on Windows XP

If you need to delete the USB drivers from your operating system because of a wrong installation, please open the device manager of Windows XP. Therefore please click on Start > control panel, like represented in figure 2.7.

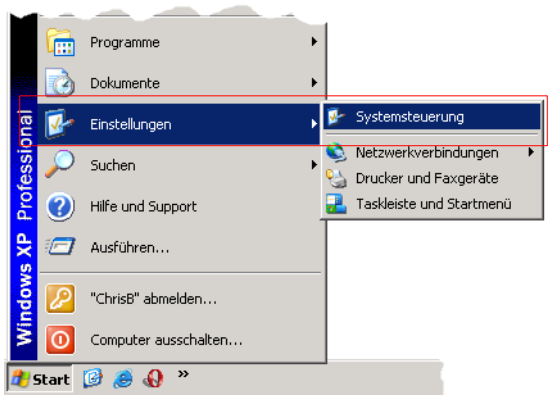


Figure 2.7: Uninstall USB drivers: Windows XP, Step 1

After that a dialog like in figure 2.8 appears. There you can find the entry system and click twice on it.

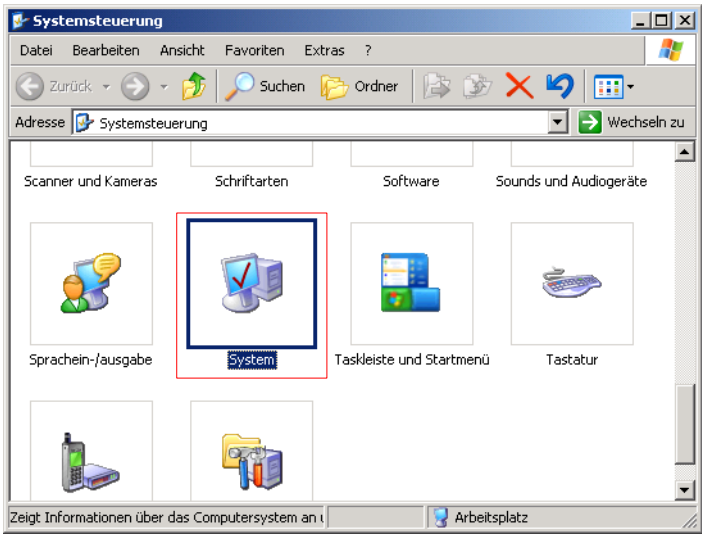


Figure 2.8: Uninstall USB drivers: Windows XP, Step 2

The dialog from figure 2.9 appears on your screen. Click on the tab hardware and after that the button device manager.

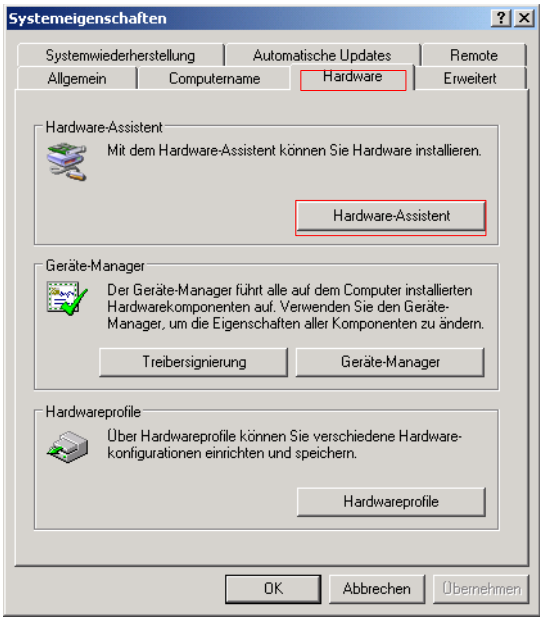


Figure 2.9: Uninstall USB drivers: Windows XP, Step 3

A list of devices like in figure 2.10 will be represented. There you can find the entry USBController. By clicking the plus symbol next of this entry, all available USB devices will be shown.

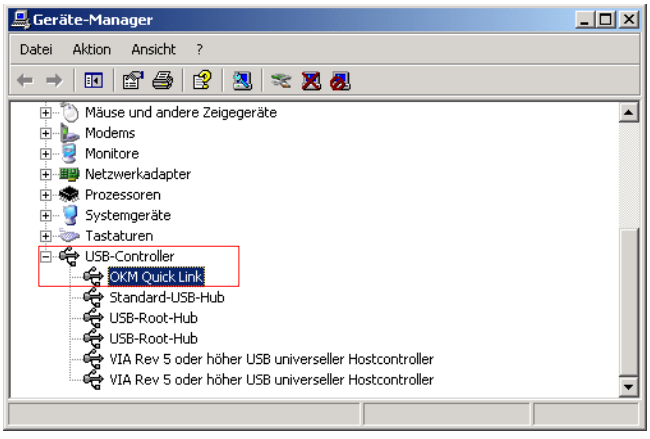


Figure 2.10: Uninstall USB drivers: Windows XP, Step 4

Mark the device which you like to delete, which means ". Additionally the device may be listed as “OKM Quick Link”. Then click on the button. Alternatively you can select the entry Uninstall in the menu Action.

Figure 2.11: Uninstall USB drivers: Windows XP, Step 5

The dialog from figure 2.1 appears. Click there on the button OK. Now all drivers will be deleted from your computer. If needed you can now install the USB driver again correctly.

2.2 Windows Vista

The instructions in this section are only valid for the Windows Vista operating system.

2.2.1 Install USB drivers on Windows Vista

The installation of the USB drivers in Windows Vista is relatively simple. After you have connected the device with your computer, switch it on and the message from figure 2.12 appears on your screen. Click on **Locate and install driver software (recommended)**.

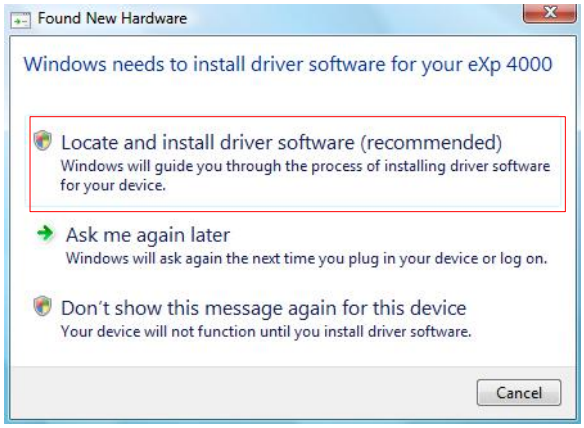


Figure 2.12: Install USB drivers: Windows Vista, Step 1

At the next window, shown in figure 2.13, click on **Don't search online**.

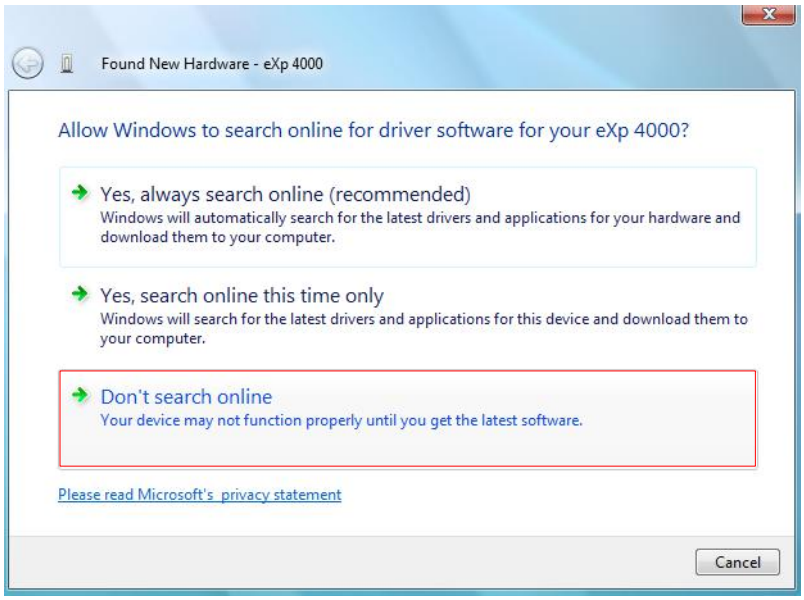


Figure 2.13: Install USB drivers: Windows Vista, Step 2

When the window from figure 2.14 is visible, insert the software CD with the USB drivers into your CD drive and click on the **Next** button. Windows will now search for the correct USB drivers automatically.

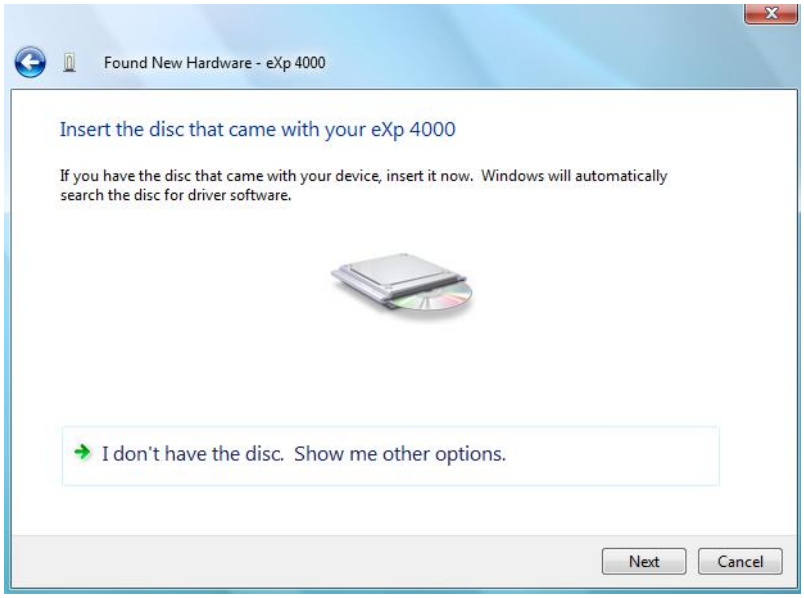


Figure 2.14: Install USB drivers: Windows Vista, Step 3

When the installation has finished the completion screen from figure 2.15 is displayed. Press **Close** to close this window.

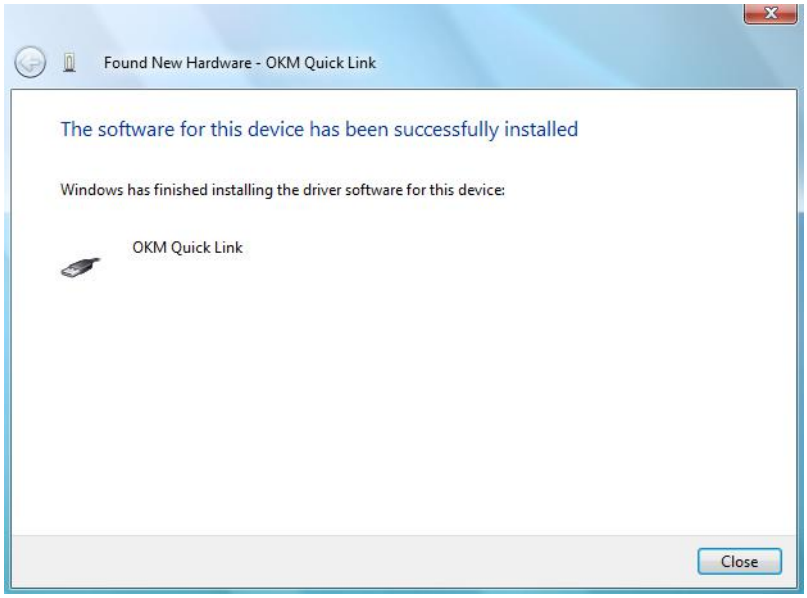


Figure 2.15: Install USB drivers: Windows Vista, Step 4

Now you have completed the installation of the USB drivers in Windows Vista, which will be confirmed by presenting the message from figure 2.16.

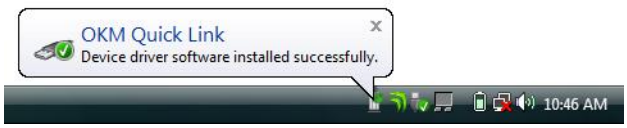


Figure 2.16: Install USB drivers: Windows Vista, Step 5

2.2.2 Update USB drivers on Windows Vista

If you need to update the USB drivers on your operating system or the initial installation failed, please open up the Device Manager of Windows Vista. Therefore press the Windows start button and click on **Control Panel**.

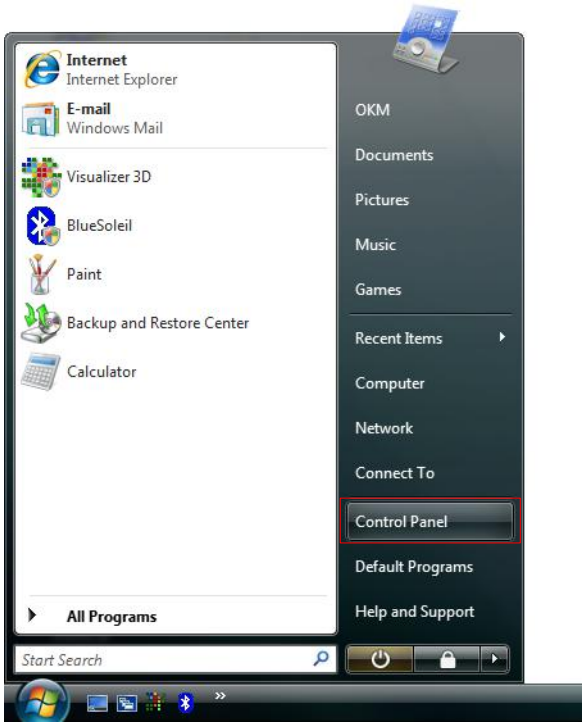


Figure 2.17: Update USB drivers on Windows Vista, Step 1

At the next screen, shown in figure 2.18, select **View hardware and devices** which can be found on the bottom of the left sidebar.

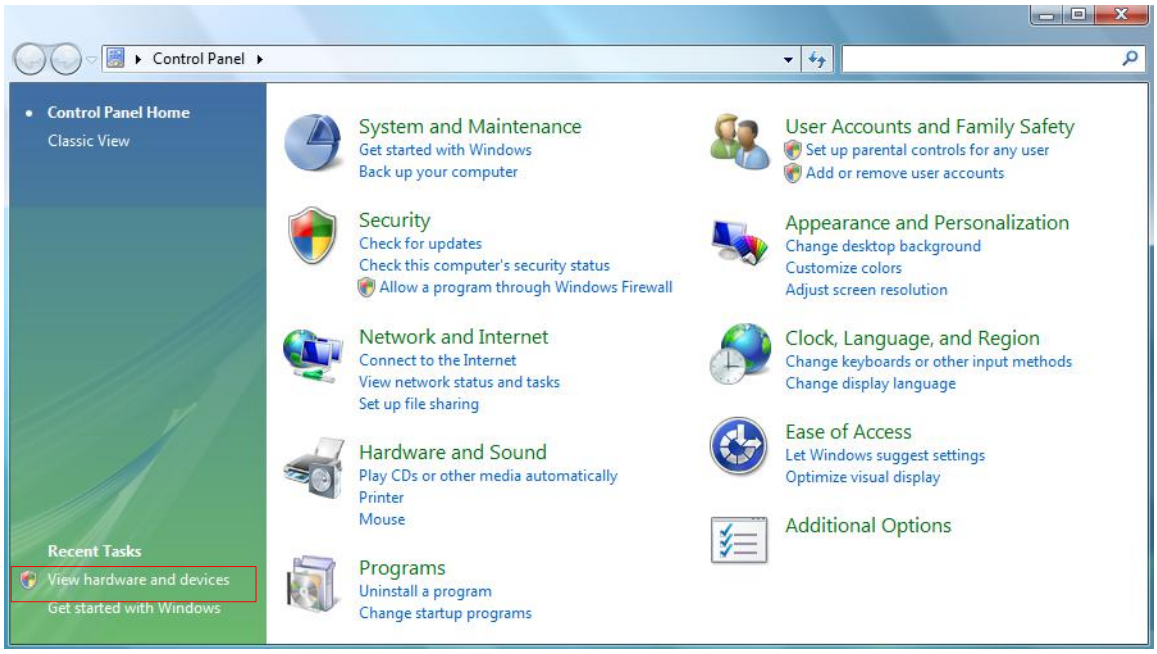


Figure 2.18: Update USB drivers on Windows Vista, Step 2

In the Device Manager (see figure 2.20) there will be a device under *Other devices* with a yellow warning symbol to indicate a problem i.e. no driver installed. If the drivers has been installed already it will show up under *Universal Serial Port Controllers*. The text next to this device will depend on the device attached. In this example the device was an eXp 4000 device. Right click on the device (eXp 4000 in this example) to bring up a menu as shown below.

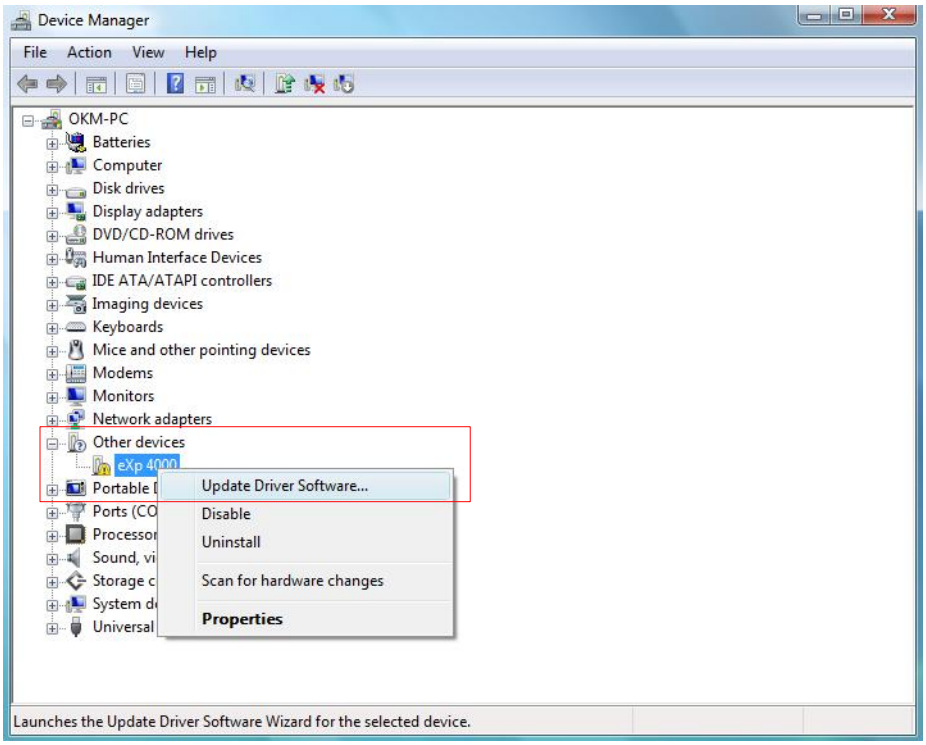


Figure 2.19: Update USB drivers on Windows Vista, Step 3

From the displayed menu select **Update Driver Software...** which then displays the option for an automatic or manual search. Select the second option to browse manually.

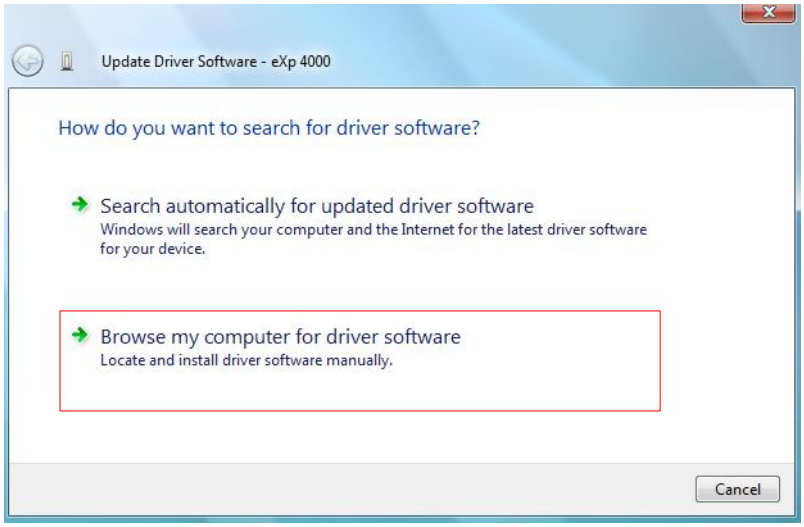


Figure 2.20: Update USB drivers on Windows Vista, Step 4

In the address box put the exact location where the drivers have been saved to. Usally this may be your software CD or a folder on the PC if you downloaded the drivers from our website. It is not necessarily the exact same location as shown in the screenshot of figure 2.32.

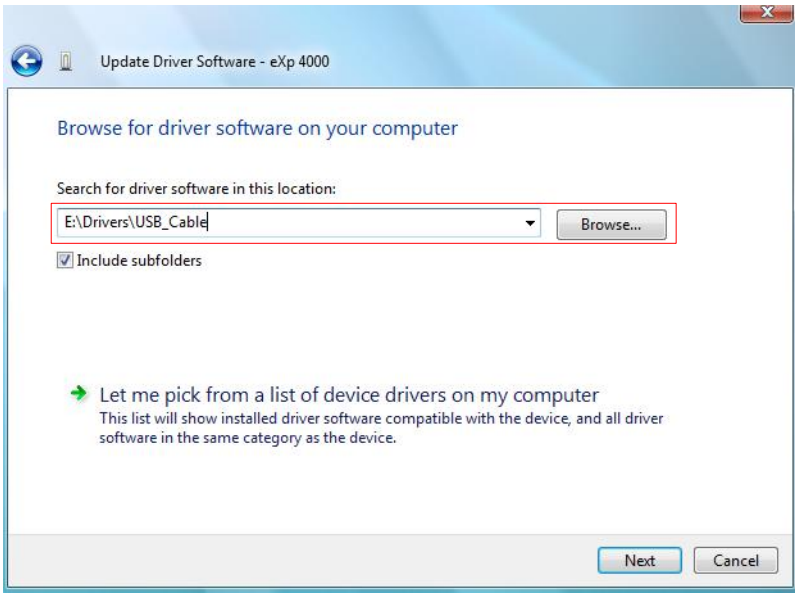


Figure 2.21: Update USB drivers on Windows Vista, Step 5

After entering the drivers location select **Next** to start the installation.

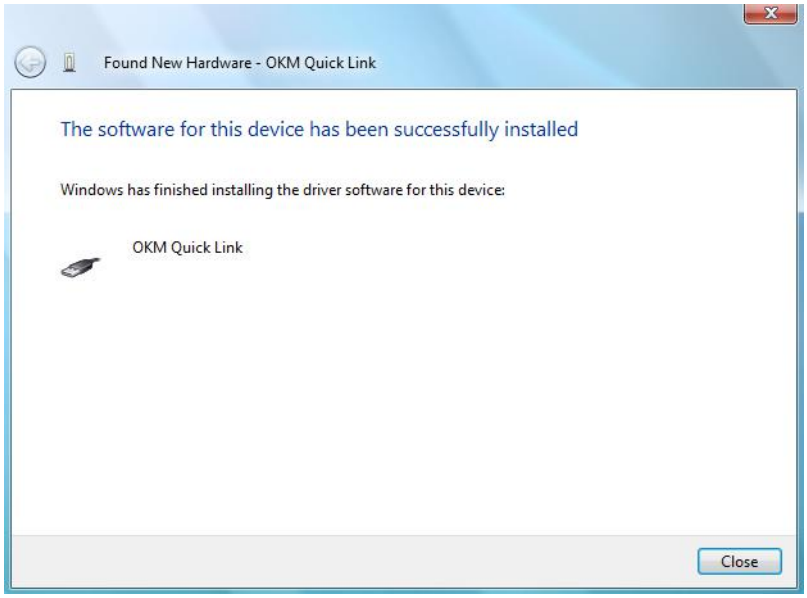


Figure 2.22: Update USB drivers on Windows Vista, Step 6

When the installation has finished the completion screen from figure 2.31 is displayed. Press **Close** to close this window and go back to the Device Manager.

The Device Manager will now show a device under *Universal Serial Bus Controllers* indicated in the screenshot below as *OKM Quick Link*.

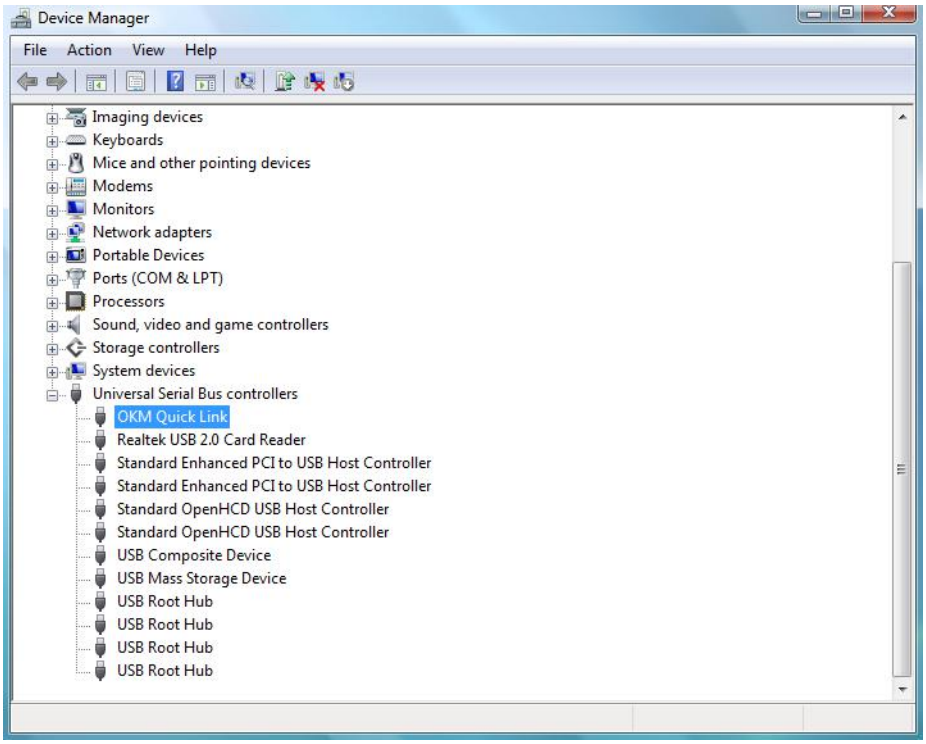


Figure 2.23: Update USB drivers on Windows Vista, Step 7

The USB drivers are correctly updated/installed now and you can close the Device Manager window.

2.2.3 Uninstall USB drivers on Windows Vista

If you need to delete the USB drivers from your Windows Vista operating system, please open up the Device Manager as described in the previous subsection.

Installed devices can be removed using the Device Manager by simply right-clicking on the mouse and selecting **Uninstall**. This will delete the associated registry entries for that device only.

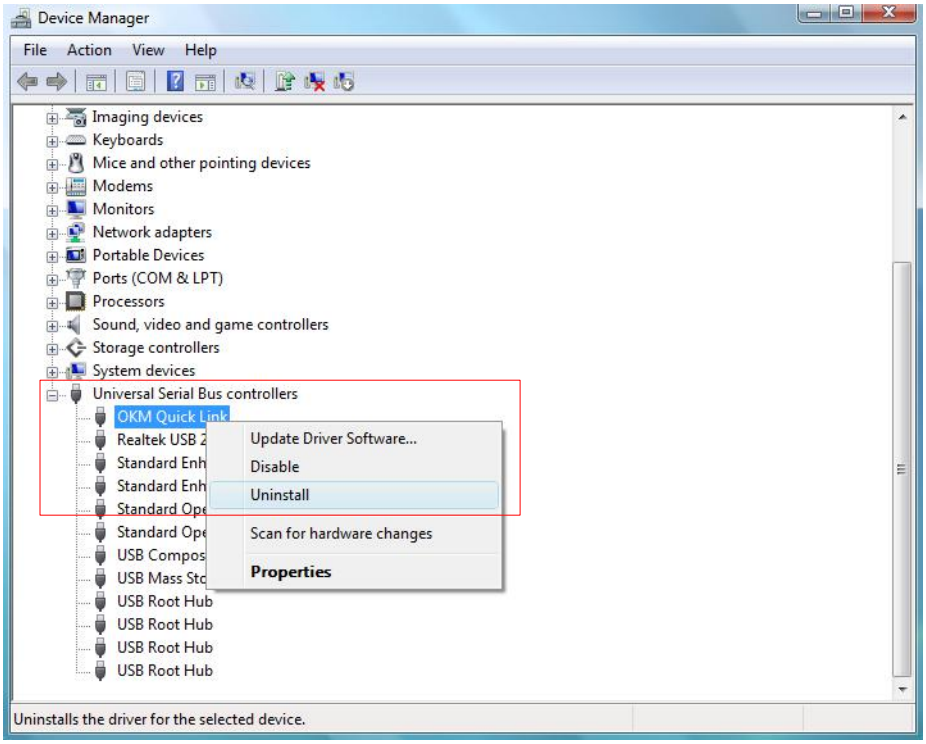


Figure 2.24: Uninstall USB drivers on Windows Vista, Step 1

Windows Vista provides an automatic method to delete driver files via check box *"Delete the driver software for this device"* on the uninstall dialog box. Just mark the check box and click **OK** to remove the installed USB drivers of your device.

Figure 2.25: Uninstall USB drivers on Windows Vista, Step 2

2.3 Windows 7

The instructions in this section are only valid for the Windows 7 operating system.

2.3.1 Install USB drivers on Windows 7

The installation of the USB drivers on Windows 7 is a little bit different as known from previous Windows versions. Connect the device to a spare USB port on your PC and make sure everything is switched on. Windows 7 is now trying to install the latest USB drivers and displays the message from figure 2.26.

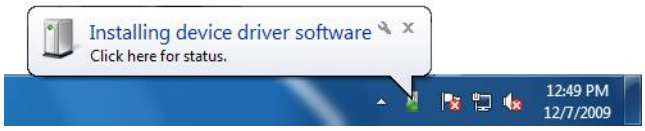


Figure 2.26: Install USB drivers on Windows 7 - Step 1

Shortly after this Windows 7 will bring up a new message as shown in figure 2.27 to inform you about the fact that it could not install any drivers for your device successfully.

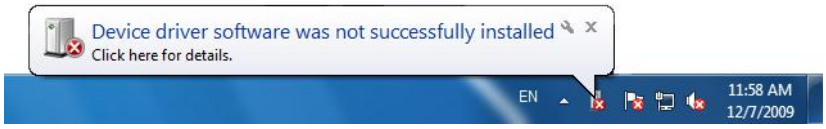


Figure 2.27: Install USB drivers on Windows 7 - Step 2

Press the Windows 7 start button to bring up the start menu and select **Control Panel** as shown in figure 2.29.

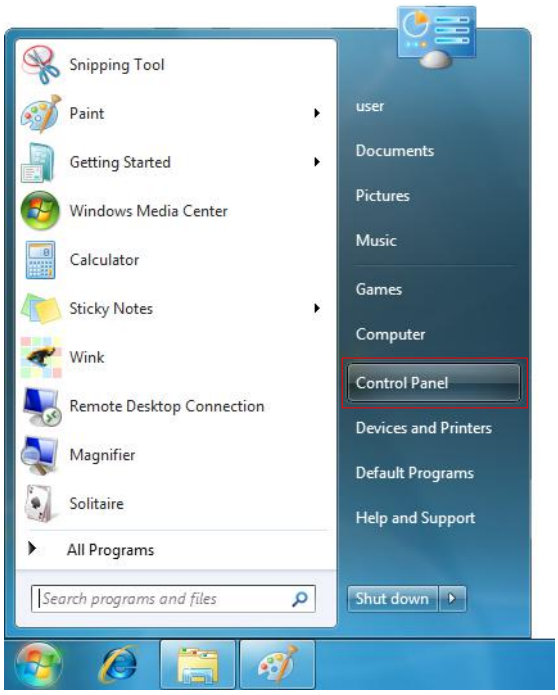


Figure 2.28: Install USB drivers on Windows 7 - Step 3

This will open up the control panel window as shown in figure 2.17. From the control panel window you have to select **Hardware and Sound**.

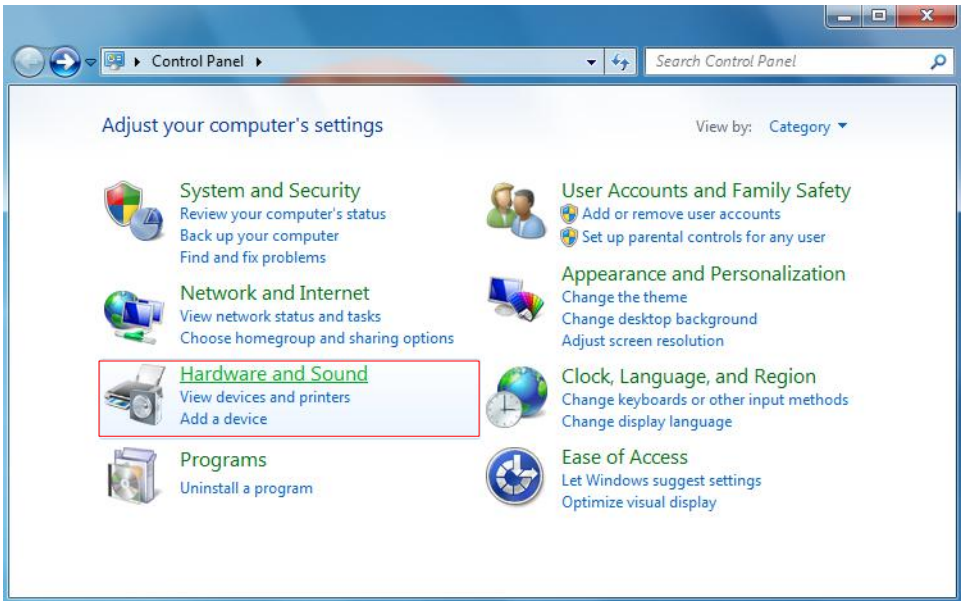


Figure 2.29: Install USB drivers on Windows 7 - Step 4

At the next screen, shown in figure 2.19, select **Device Manager** which can be found under *Devices and Printers*.

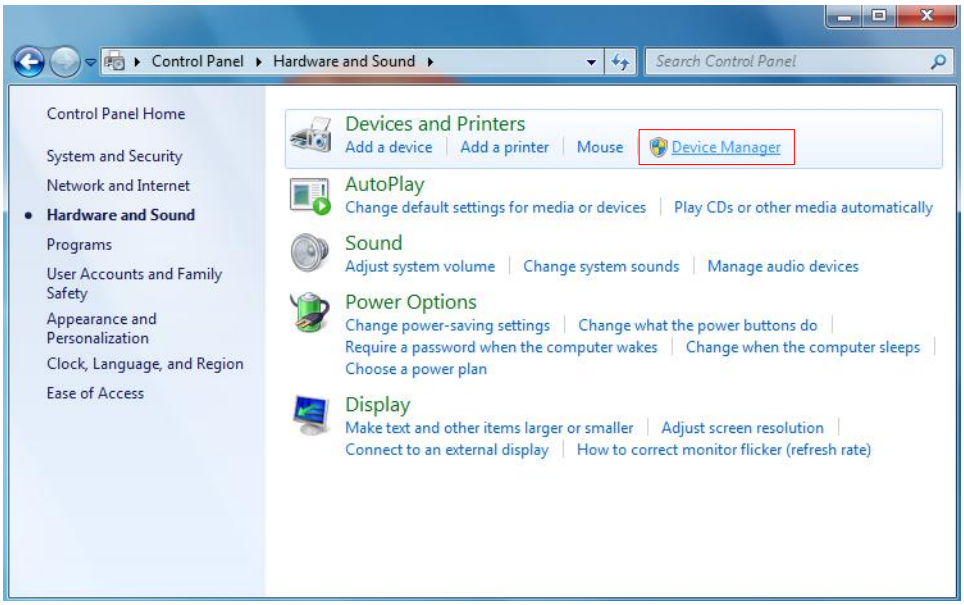


Figure 2.30: Install USB drivers on Windows 7 - Step 5

In the Device Manager (see figure 2.20) there will be a device under *Other devices* with a yellow warning symbol to indicate a problem i.e. no driver installed. The text next to this device will depend on the device attached. In this example the device was an eXp 4000 device. Right click on the other device (eXp 4000 in this example) to bring up a menu as shown below.

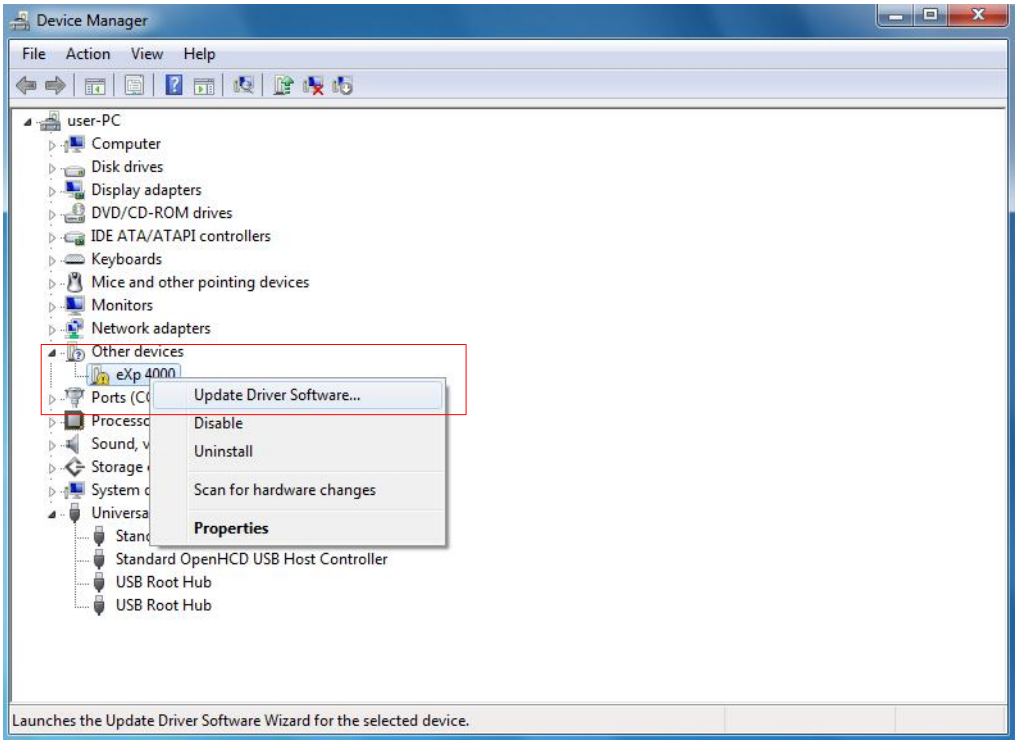


Figure 2.31: Install USB drivers on Windows 7 - Step 6

From the displayed menu select **Update Driver Software...** which then displays the option for an automatic or manual search. Select the second option to browse manually.

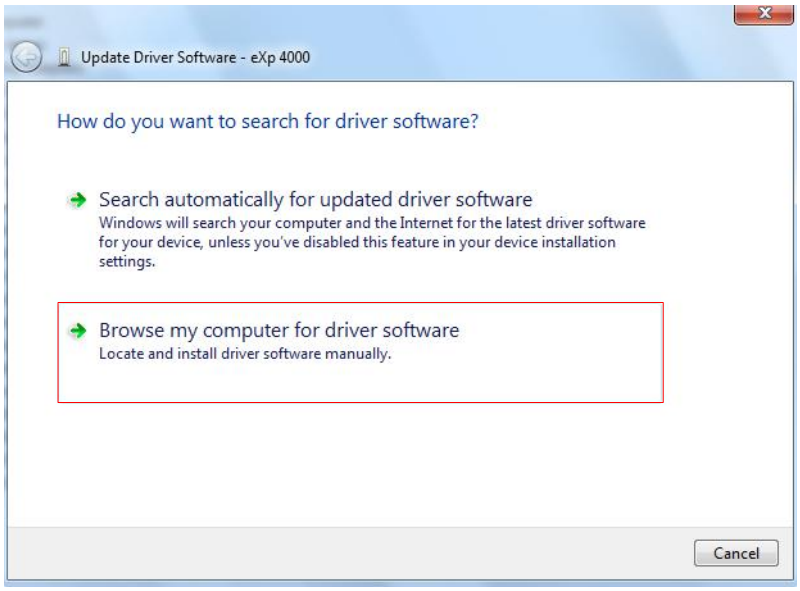


Figure 2.32: Install USB drivers on Windows 7 - Step 7

In the address box put the exact location where the drivers have been saved to. Usally this may be your software CD or a folder on the PC if you downloaded the drivers from our website. It is not necessarily the exact same location as shown in the screenshot of figure 2.30.

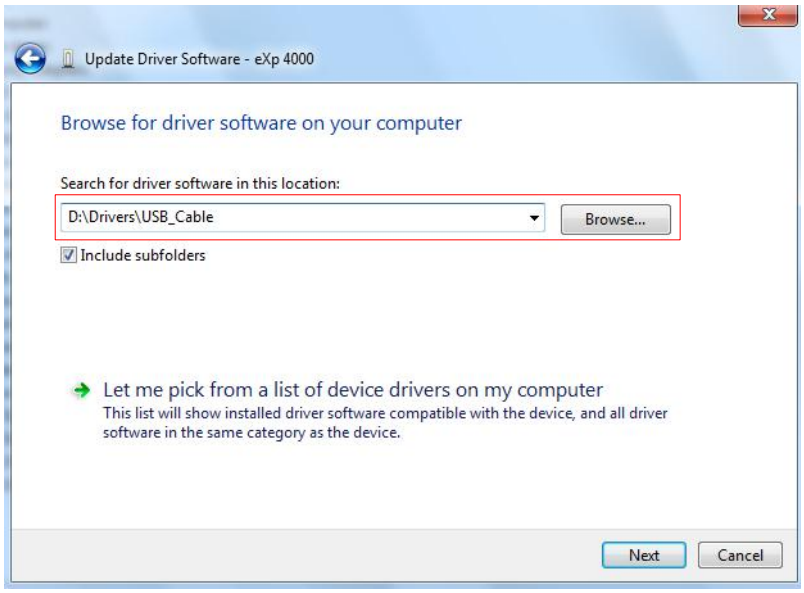


Figure 2.33: Install USB drivers on Windows 7 - Step 8

After entering the drivers location select **Next** to start the installation.

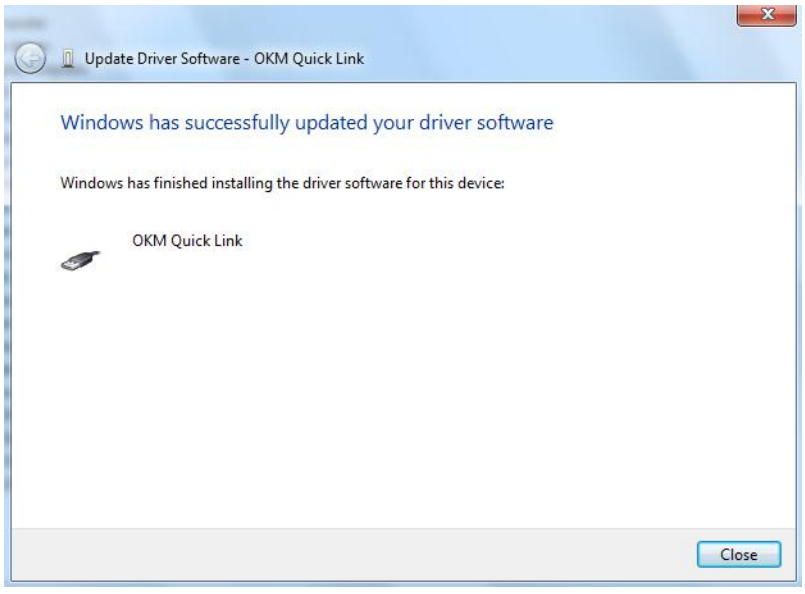


Figure 2.34: Install USB drivers on Windows 7 - Step 9

When the installation has finished the completion screen from figure 2.28 is displayed. Press **Close** to close this window and go back to the Device Manager.

The Device Manager will now show a device under *Universal Serial Bus Controllers* indicated in the screenshot below as *OKM Quick Link*.

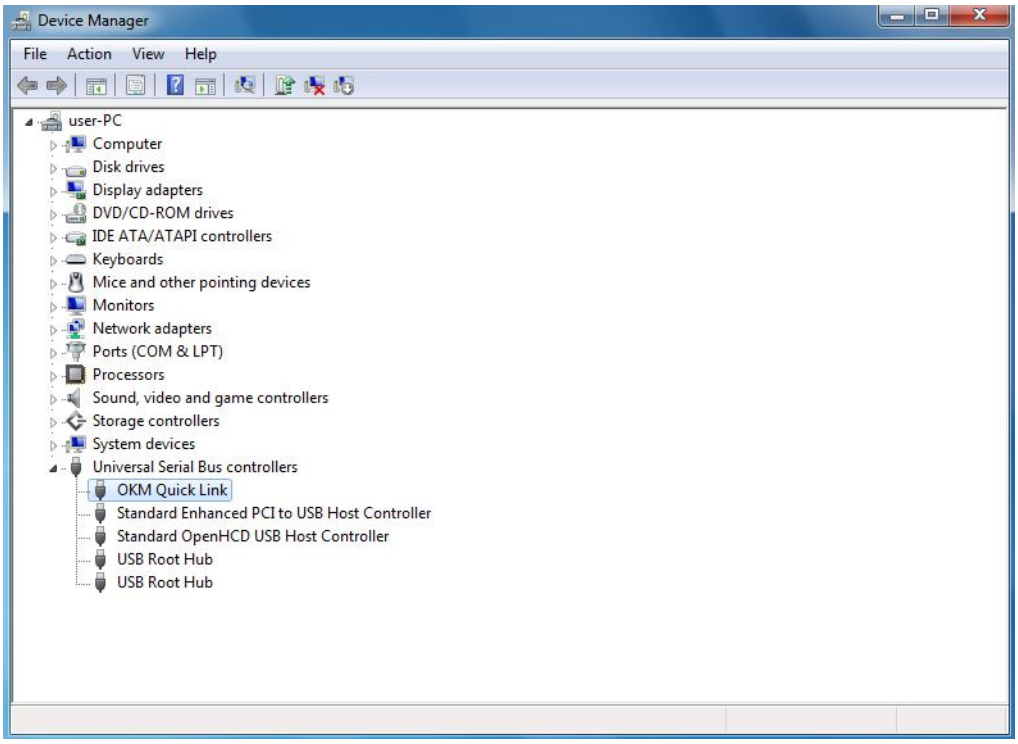


Figure 2.35: Install USB drivers on Windows 7 - Step 10

The USB drivers are correctly installed now and you can close the Device Manager window.

2.3.2 Uninstall USB drivers on Windows 7

If you need to delete the USB drivers from your Windows 7 operating system, please open up the Device Manager as described in the previous subsection.

Installed devices can be removed using the Device Manager by simply right-clicking on the mouse and selecting **Uninstall**. This will delete the associated registry entries for that device only.

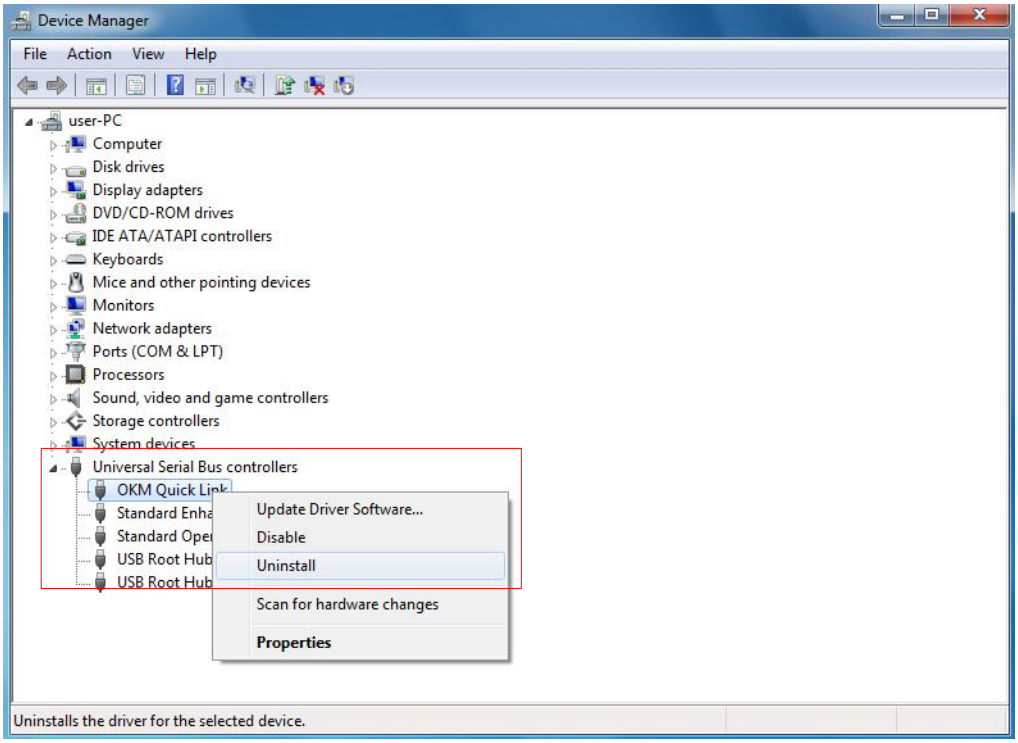


Figure 2.36: Uninstall USB drivers on Windows 7 - Step 1

Windows 7 provides an automatic method to delete driver files via check box *"Delete the driver software for this device"* on the uninstall dialog box. Just mark the check box and click **OK** to remove the installed USB drivers of your device.

Figure 2.37: Uninstall USB drivers on Windows 7 - Step 2

Chapter 3

Technical specifications

The following technical indications are medial values. During operation small variations are quite possible. Technical changes due to development are possible!

3.1 Control unit

Dimensions (H x W x D) ..... 180 x 230 x 120 mm
Weight ..... approx. 1.2 kg
Processor ..... Atmel, 15 MHz
Display ..... OLED, 2 x 16 Digits
Data memory ..... Internal, 64 KB (about 32700 measured values)
Protection Class IP40
Operating time (internal battery) ..... approx. 24 hours
Charging time (internal battery) ..... approx. 3 hours
Input (charger socket) ..... 19 VDC / 0.6 A (max. 24 VDC / 0.5 A)
Operating time (optional Power Pack) ..... approx. 48 hours
Input (optional Power Pack) ..... 12.5 VDC / 0.9 A (max. 24 VDC / 0.5 A)
Operating temperature ..... -5 – 50 °C
Storage temperature ..... -20 – 60 °C
Air humidity ..... 5 % – 75 %
Waterproof ..... No

3.2 Telescopic Super Sensor

Dimensions (L x D) ..... 540/1180 x 80 mm
Weight ..... approx. 1.3 kg
Sensor technology SCMI-15-D

3.3 Data Transmission

Technology ..... USB, OKM Quick Link
Maximal Data Transmission Rate ..... 9600 Baud

3.4 Computer, minimum requirements

The indicated values should help you for a correct selection of a suitable computer for analysis of your measured results.

CD-ROM drive ..... min. 4x
Interface (data transmission) ..... USB
Free disk space ..... min. 50 MB
Working memory (RAM) ..... min. 256 MB
Graphic card ..... min. 128 MB, OpenGL-compatible
Operating system ..... Windows Vista, Windows 7 - 10

Chapter 4

Scope of delivery

In the following section you can find all standard equipment and optional parts of 3D Ground Navigator. The scope of delivery can be different in some circumstances because of some optional accessories which should not be included in the basic equipment.

Description	Quantity
Control unit with carrying strap	1
Wireless Bluetooth headphones	1
Telescopic Super Sensor with mountable handle	1
Visualizer 3D Software	1
Charger for control unit	1
USB cable	1
User's manual	1
Carrying case	1
Power Pack	optional
Mounting Kit for Power Pack	optional

Table 1: Scope of delivery

Chapter 5

Control elements

In this section you will learn more about the fundamental use of all control elements for this measuring instrument. All connections, inputs and outputs are explained in detail.

5.1 Breakdown of the Ground Navigator

The key components to the 3D Ground Navigator are shown below.

Figure 5.1: 3D Ground Navigator with Control Unit and Telescopic Super Sensor

The **Control Unit** is the operating center and processing unit of the whole detector system. You will select your appropriate operating mode and adjust all settings to scan your area.

The **Telescopic Super Sensor** measures the environment and transfers all data to the Control Unit for further processing. The Super Sensor comes with a mountable **Sensor Handle** to ease carrying.

If the control unit detects **Wireless Bluetooth Headphones** it will connect to it and turns off the internal speaker.

For much longer operating times an optional **Power Pack** can be utilized with the detector.

5.2 Control unit

The next subsections explain all control elements of the Control Unit. Thus you become familiar with the buttons, sockets and the like.

5.2.1 Top/Front View

Figure 5.2 shows all control elements of the top and front panel of the Control Unit.

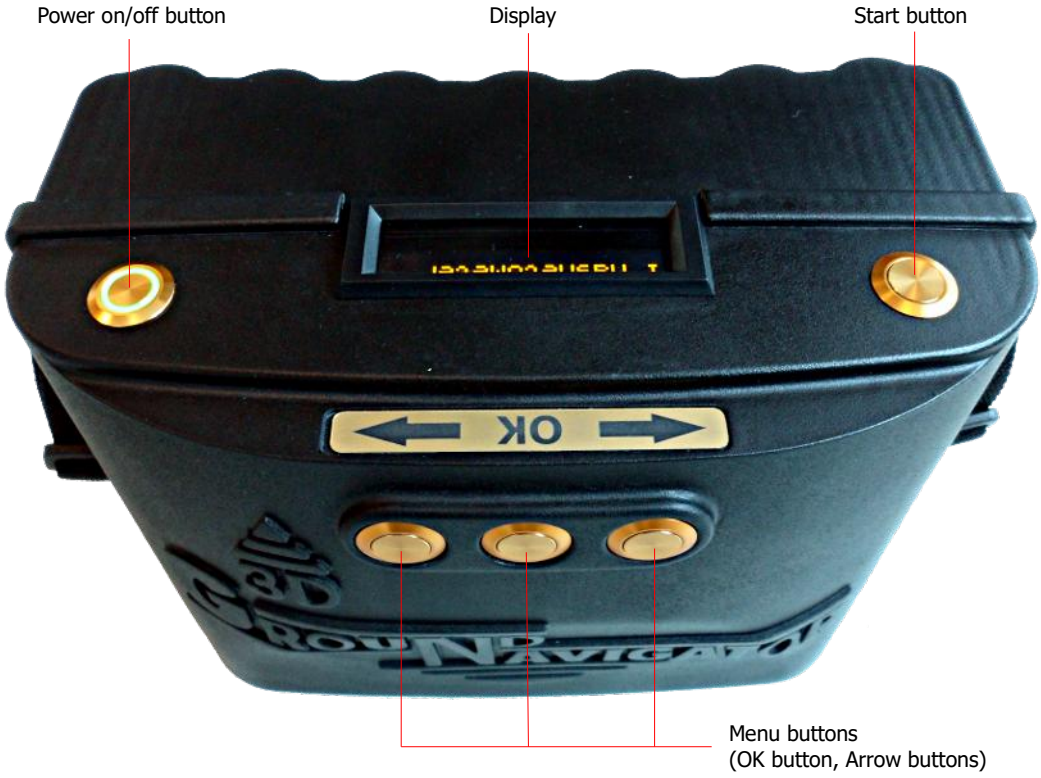


Figure 5.2: Control elements of the top and front panel

Display: The display of the device shows all operating modes, messages and measuring states. Close to the display (on the front panel) there are 3 menu buttons to operate the device. The **OK** button is mostly used to activate the selected operating mode. In some circumstances this button is allocated with another function which will be explained at the appropriate section inside this manual. By using the arrow buttons ← and → you can switch between the operating modes in the main menu and select the options in the submenus. With these arrow buttons you can finish the measurement of an operating mode and get back into the main menu.

Power on/off button: With the power on/off button you can switch on or off the device. When the device is powered off and you press the power on/off button the device will be switched on and the LED of the power on/off button will shine green. To power off the device, you should keep pressing the power on/off button until the devices powers off and the integrated LED lamp turns out.

Start button: Primarily the start button is used to start a measurement and to release every single impulse in the manual impulse mode.

5.2.2 Bottom View

Figure 5.3 shows all control elements on the bottom side of the Control Unit.

Figure 5.3: Overview of control elements of the control unit

Charger socket: The charger socket is used to recharge the internal battery. While charging the battery, the **Charge-LED** is shining “green”. See section 5.2.3 “Charging the internal battery” on page 41 for more details about charging the control unit!

Socket for power pack: Additional to the internal battery it is possible to connect OKM's optional Power Pack. By using this Power Pack you can extend your operating time by another 48 hours.

Socket for probe: At this socket you should connect the Telescopic Super Sensor. Without the probe there is no measurement possible.

USB socket: This socket is used to connect the device with a computer or Tablet PC via USB cable. So you can transfer measured data to the Visualizer 3D software.

5.2.3 Charging the internal battery

Switch off the detector, connect the original charger to the charge socket of the 3D Ground Navigator and plug the charger into a power socket. Now the Charge-LED will shine green until the battery has been charged completely. After the battery is fully charged, the Charge-LED turns off.

> Only use the original OKM charger for recharging the internal battery!
> Otherwise the battery may be damaged or explode.

5.3 Telescopic Super Sensor

The Telescopic Super Sensor consists of 3 segments that can be extended from 54 cm to a maximum of 118 cm. Additionally a mountable Sensor Handle can be attached to the probe.

Figure 5.4: Telescopic Super Sensor

Extending the Telescopic Super Sensor is explained in chapter 6.2 “Extending the Telescopic Super Sensor” on page 44.

Chapter 6

Assembly & Preparation

In this section is explained how to assemble the device and how to prepare the detector for a measurement.

Before you can use the device 3D Ground Navigator for a field measurement you should do some preparations. Please pay attention to the following steps!

6.1 Charging the control unit

Switch off the device, connect the original charger with the charge socket of the detector and plug it into a power socket as shown in figure 6.1.

Figure 6.1: Charging the internal battery of the control unit

Now the Charge-LED will shine green until the battery has been charged completely. After the battery is fully charged, the Charge-LED turns off.

> Only use the original OKM charger for recharging the internal battery!
> Otherwise the battery may be damaged or explode.

6.2 Extending the Telescopic Super Sensor

Always hold tight the upper segment of the Telescopic Super Sensor with your right hand and grab one of the lower segments with your left hand as shown in figure 6.2.

Figure 6.2: Hold tight the upper segment, while extending the lower segments

Now you have to unlock the lower segment by turning it towards yourself. Make sure that you only grab the tube itself, not the plastic rings or rubber parts.

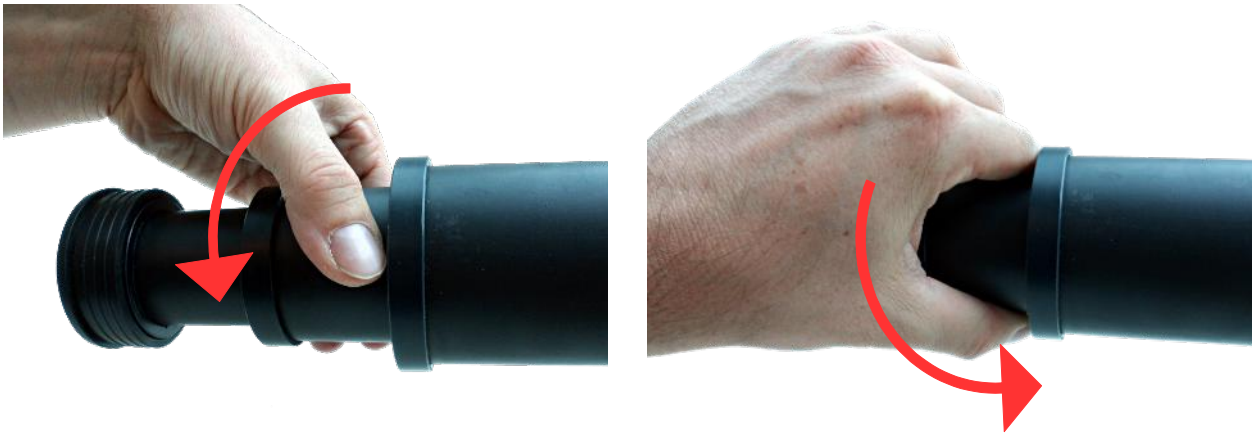


Figure 6.3: Unlock the lower segments

You just need to turn it a little bit to unlock the segments. After that you may resize the length of the Super Sensor according to your personal needs.

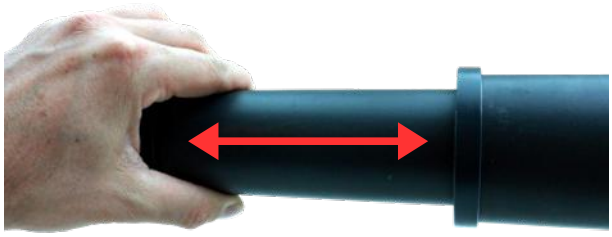


Figure 6.4: Resize the length of the Super Sensor

After you have adjusted the length of the Super Sensor, you need to lock the segments again. To do so, you just have to turn the lower segment back into place. Grab the lower segment directly on the tube again and turn it away from you.

Figure 6.5: Lock the lower segments

6.3 Mounting the Sensor Handle

If you like to use the mountable handle to carry your Super Sensor, place the handle on top of the probe as shown in figure 6.6. The male clip of the Super Sensor has to match the female clip of the handle.

Figure 6.6: Preparing the sensor handle for mounting

If the handle is placed over the male clip, turn it to the right (away from the cable).

Figure 6.7: Turn the handle to the right to fix it

Now the handle is ready to use.

6.4 Preparing the Control Unit

The Telescopic Super Sensor is used to measure the underground values and should be connected to the socket on the bottom of the unit. Avoid hard impact or other damages. Plug in the connector of the Super Sensor into the designated socket and turn it left or right until it locks into place (when you pull on the connector, it will be detached from the socket).

Figure 6.9: Connecting the Super Sensor

To supply the device with additional power, you can also connect the optional Power Pack. Plug in the connector of the Power Pack in the designated socket and turn it to left or right until it locks into place (when you pull on the connector, it will be detached from the socket).

Figure 6.10: Connecting the Power Pack (optional)

Now switch on the Power Pack. The LED indicator will shine green. Please refer to the user's manual of the Power Pack for further information concerning its use!

After connecting and switching on the Power Pack you can simply put it in your trouser pocket or other pocket.

Figure 6.11: Pocket the optional Power Pack (optional)

You may also use the Mounting Kit to wear the Power Pack on a belt around your body. Please contact your local dealer for more information concerning this helpful tool!

Now you should power on the device with the power on/off button and you are ready to perform your measurements.

Figure 6.12: Power on your control unit and get ready to scan

Chapter 7

Operating modes

In this section you will learn more about operating the device. Every operating mode will be explained in a proper subsection.

Every time when you power on the device with the power on/off button the device type and device version will be displayed. After that, you will enter into the main menu where you can select all available operating modes.

The device 3D Ground Navigator offers the following operating modes:

- **1 Magnetometer**
  An acoustical magnetic field measurement will be done.
- **2 Ground Scan**
  A graphical measurement for analysis on a computer will be done.
- **3 Discrimination**
  Measured values for metal analysis will be sent directly to a computer.
- **4 Transfer Memory To PC**
  Measurement values will be sent from the internal memory to a PC for analysis.
- **5 System Information**
  Shows information about the firmware version and the charge state of the internal battery.

The selection of the correct operating mode depends on the planned mission. Normally you should use several operating modes one after another to explore an area. In this way you can obtain as much information as possible from the underground of the scanned area.

The complete menu structure of 3D Ground Navigator you can find in figure 7.1 as a schematic representation.

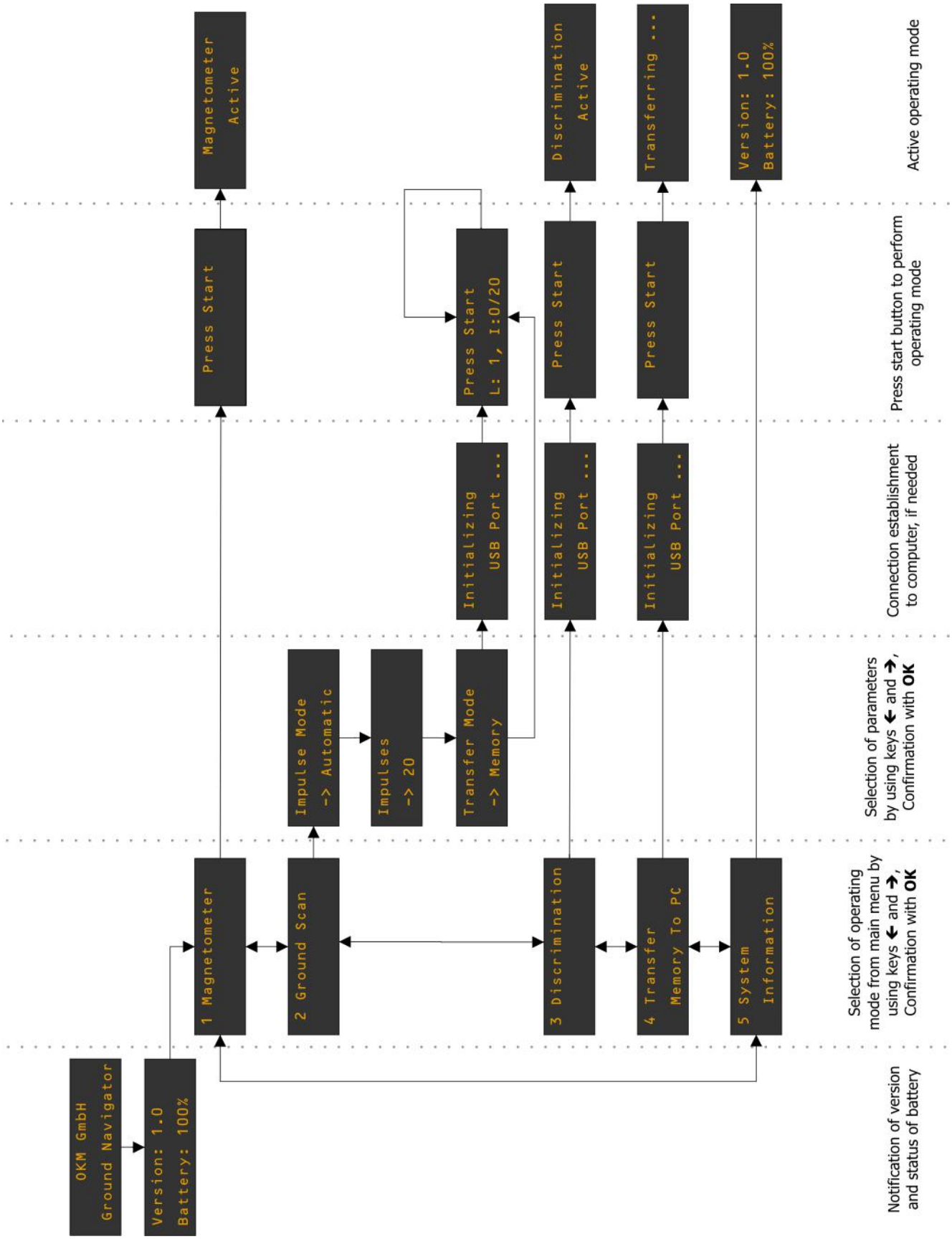


Figure 7.1: Main menu structure

7.1 Magnetometer

With operating mode "Magnetometer" you can research an area regarding to ferromagnetic[1] metals. This mode is only an acoustical mode, which does not create any graphical representation.

Please note that it can also react on metallic trash or contamination laying on the surface or near to the surface.

Power on the device and select the operating mode "Magnetometer" from the main menu. Press the **OK** button to select this operating mode. Now the display shows "*Press Start*". Before pushing the start button, make sure you are holding the Super Sensor straight downward to the ground. Then push the start button. The display now shows the message "*Magnetometer Active*". At this moment (you are not moving the probe) no sound should come from the device.

Figure 7.2: Probe should always point downwards and should not be rotated

Now you can move slowly forward, backwards and sidewards, but you should avoid turning/rotating the probe. The probe should always point vertical to the ground and should not be turned around its own axis.

Figure 7.3: Pivoting or turning of the probe falisifies the measurement

1 Ferromagnetic metals are for example iron, cobalt and nickel. Also other metals or objects, which include traces of such metals can be detected.

As soon as an acoustical signal sounds, the device has detected a possible metal target right under the position of the probe. In this way it is possible to find small metals near the surface like for example nails, screws, wires, seals and similar targets.

You should use the operating mode "Magnetometer", to remove such disturbing metal pieces from the area, you like to scan. The less metals are laying near to the surface, the better will be your result in the operating mode "Ground Scan". You can also find larger metal targets which are located deeper underground. A general norm is: The larger the target, the deeper it can be detected underground!

Also you can use the operating mode "Magnetometer" as a useful pin-pointer during excavations. If you already have dug out a large hole and do not remember where exactly the detected object is situated, you can simply use the Magnetometer mode to quickly and efficiently relocate the target's position.

To finish the operating mode "Magnetometer" and return back into the main menu you should press one of the arrow buttons ← or →.

7.2 Ground Scan

The operating mode "Ground Scan" allows a graphical measurement of any area for analysis on a computer.

Power on the device and select the operating mode "Ground Scan" in the main menu by using the arrow keys ← and →. Press the **OK** button to activate the operating mode. Now you have the option to adjust 3 different parameters. The first parameter is the impulse mode and offers the following choices:

- **Automatic**
  Each measure value will be recorded automatically and continuously without any break.
- **Manual**
  One measure value will only be recorded after you have pressed the start button.

The second adjustable parameter is the number of measure points (*Impulses)*, which will be recorded for each single scanning path. The following choices can be made:

- **Auto**
  The number of measure points of one scanning path will only be defined during the measurement. At the end of the first scanning path the start button should be pressed to save the required number of measure points. This number of measure points will than be used automatically for all following scanning paths. Beginning from the second scanning path the device will stop by itself, when the defined number of measure points has been sent out.
  If you select "Auto" you are not able to do a direct transfer to a computer. You can only store the measured values in the internal memory of the device, because the exact length of field is not yet selected.
- **10, 20, ..., 200**
  Each scanning path consists of the selected number of measure points. At the end of each scanning path the device stops by itself, as soon as the number of measure points is achieved.

In a final step you have to define the type of data transfer (*Transfer Mode*). You should select one of the following choices:

- **Memory**
  The measured data will be stored in the internal memory of the device. After finishing the measurement you should transfer the data to a PC by using the operating mode "Transfer Memory To PC". You can only store one measurement at a time in the internal memory. As soon as a new measurement will be recorded, the measured data from the previous measurement will be deleted irrevocable.

- **Computer**
  The measured data will be transferred right away to a computer. Therefor a usb cable connection to a computer must be established before starting the measurement. The option "Computer" is not available if the number of impulses (*Impulses*) has been set to "Auto".

After all parameters has been adjusted the device is ready to start the first scanning path. Beginning from this moment the display will indicate the current number of scanning paths and the current number of measured impulses per scanning path.

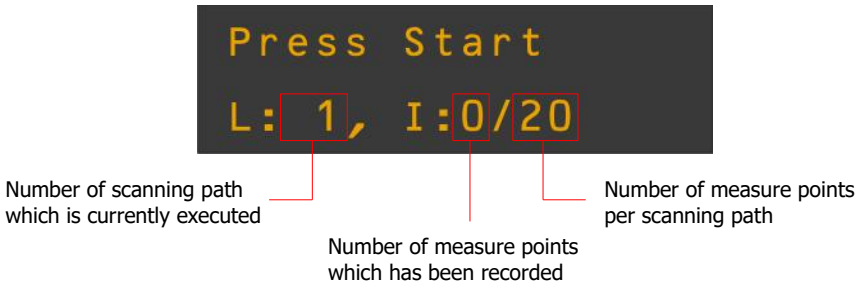


Figure 7.4: Display representation in operating mode "Ground Scan"

The figure 7.4 shows the display which indicates that the first scanning path has begun and no impulse has been measured up to now. In total there will be 20 measure points per scanning path. The device is waiting for the user to press the start button to begin the measurement recording.

Please go to your start position of the first scanning path and press the start button.

a) If you have selected the impulse mode "Automatic" just keep going slowly until you have reached the end of the first scanning path. When you already have defined the number of impulses than the device will stop automatically at the end of the line, otherwise you should press the start button when you have reached the end of the first scanning path. Now please go to the start position of the next scanning path and press the start button again. The device will stop automatically by itself at the end of the scanning path.

Figure 7.5: "Parallel" scanning in mode Ground Scan

b) If you have selected the impulse mode "Manual" you should press the start button to start your measurement. Now you are using the manual scan mode, which means you should release each single measure impulse manually one by one with the start button. The impulses will not be sent out automatically. Now you should do a little step forward and press the start button, to measure the second measure point. The device stops and you should do again a little step forward and press the start button again. Now continue in this way until you have reached the end of the first scanning path. If you already have defined the number of impulses per line, the device will automatically signalize the end of the scanning path, otherwise you should press the **OK** button when you like to finish the first line. Now go to the start position of your next scanning path and press again the start button. Go another step forward and repeat the measurement in the same way like you recorded the first scanning path. The device will now signalize automatically the end of the next scanning path.

Continue to measure all further scanning paths until you have recorded the complete measure area. To finish the operating mode "Ground Scan" and go back to the main menu you simply press one of the arrow keys ← or →.

7.3 Discrimination

In the operating mode "Discrimination" you have the possibility to distinguish between ferromagnetic and non-ferromagnetic metals. The figure 7.6 shows, how to retain the Super Sensor during the measurement.

Figure 7.6: Position of the Super Sensor during a measurement

Similar to the operating mode "Magnetometer", the Super Sensor should point vertical towards the ground. It should not be turned or pivoted.

Figure 7.7: Discrimination with Super Sensor

Normally this operating mode is used after you have executed a complete measurement in the operating mode "Ground Scan". It is mainly used to analyze the detected object in detail. Due to the analysis of the measurement results in the mode "Ground Scan" you can determine the position of a located object and now know at which place inside the measure area you should research in detail with the Super Sensor.

In this operating mode all measured data will be sent directly to a computer. Therefore it is at first necessary to set up the data transfer inside the 3d software. Figure 7.8 shows the configuration dialog of the software "Visualizer 3D". Please be sure to select the operating mode *"Discrimination"* during the configuration.

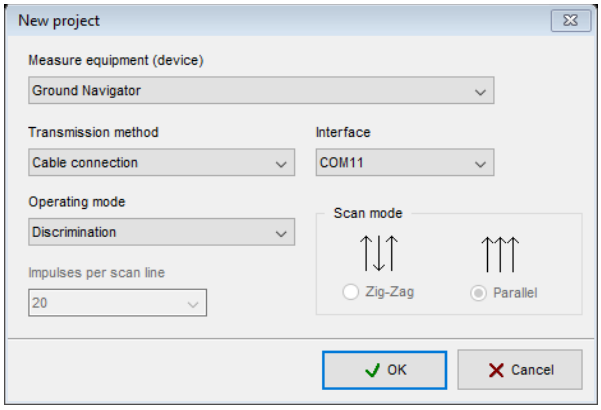
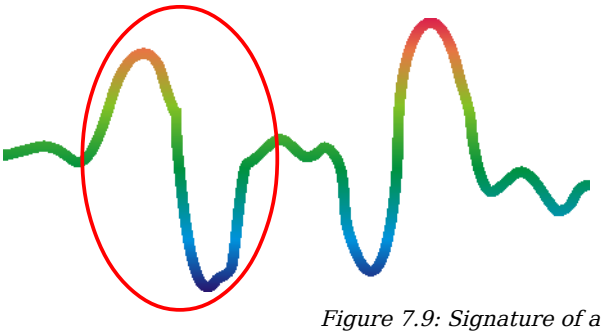


Figure 7.8: Configuration of the 3d software in operating mode "Discrimination"

To adjust the COM port correctly please also read chapter 2 ("Install/Uninstall USB drivers on Windows") on page 13! Click on the button *OK*, when you have adjusted all parameters.

After you have prepared the software for the data transfer, please go near to the detected object, power on the device and select operating mode "Discrimination" from the main menu by using the arrow keys ← and →. Press the **OK** button to activate the operating mode.

After the data transfer to computer has been established you can press the start button to start the data transfer and the measurement. Now you can slowly move the Super Sensor from one side to another above the possible object. Please try to capture the complete object, which means you should measure beyond the edges of the object. Repeat this measurement a few times to get a clear signature of the object. There are 3 different signatures, from which you can recognize a specific characteristic of any target.



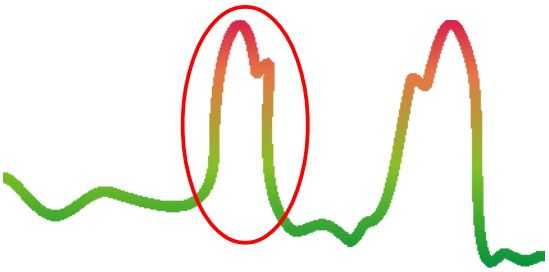
Ferromagnetic metals

Ferromagnetic targets have a positive-negative-signature.

Figure 7.9: Signature of a ferromagnetic metal target

The figure 7.9 shows a typical signature of a ferromagnetic metal like e.g. iron. The signature includes a positive (red) and a negative (blue) amplitude. When looking closely you can see even 2 ferromagnetic signatures. The first signature starts with a positive amplitude and the second signature starts with a negative amplitude. The order is not important, it depends on the direction of movement of the Super Sensor. If you keep moving the probe from one side to another, these 2 signatures will change continuously.

Take care to move the Super Sensor slowly and equal above the ground and above a detected object to get a clear signature.

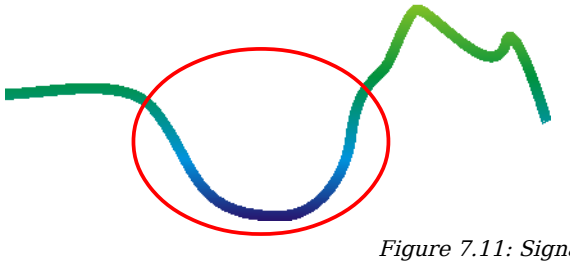


Non-ferromagnetic metals

Non-ferrous targets have a pure positive signature.

Figure 7.10: Signature of a non-ferromagnetic metal target

The figure 7.10 represents a signature of a non-ferrous target. You can recognize that there is only a positive amplitude (red). Additionally to the main amplitude there is another small peak, which is typically for precious metals. Also here the order of amplitude and the small peak is not important and depends on the scan direction.



Non-metallic targets

All non-metallic items have a pure negative signature.

Figure 7.11: Signature of a non-metallic target

The last of the typical signatures is represented in figure 7.11. It is the signature of all non-metallic targets and structures. These can be voids, tunnels or buried plastic pipes or boxes. You can recognize that there is only a negative amplitude (blue).

To quit the operating mode "Discrimination" and get back into the main menu you just have to press one of the arrow keys ← or →.

7.4 Transfer Memory To PC

By using the operating mode "Transfer Memory To PC" you can transfer measured data from the internal memory of the device to a computer. Therefore it is necessary to plug in the USB cable into the computer as well as into the control unit and prepare the software to receive the data. As soon as all settings are made in the correct way you can use this operating mode successfully.

Detailed information about the correct setting of the software you can find in the user manual of the software.

Power on the device and select the operating mode "Transfer Memory To PC" from the main menu by using the arrow keys ← and →. Press the **OK** button to activate the operating mode. The display of the device shows now the message *"Preparing USB Port ..."*. As soon as the device is ready to transfer the data the message *"Press Start"* appears in the display. Press the start button to transfer all data from the internal memory to the computer. After sending all data the message *"Finalizing USB Port ..."* will appear in the display. The operating mode "Transfer Memory To PC" will be finished automatically and you will get back into the main menu.

Chapter 8

Field procedure

This chapter gives practical instructions about the general procedure of scanning an area. The different scanning methods and procedures will be explained in detail.

8.1 General scanning procedure

In general every scan always starts on the bottom right corner of your scan area. Starting from this point, you should walk scan path by scan path, whereby every following path is situated on the left side of its previous path. During walking these lines, the measurement values will be recorded and depending on the selected operating mode either transferred directly to a computer or saved into the memory of the device.

The device stops at the end of each finished scan line, so that the user can find the starting position of the next line. In this way, all paths will be recorded and the area will be measured.

Figure 8.1 shows all 4 possible starting positions and the corresponding first scanning path. Depending on the composition of your terrain you can determine the optimal starting point for your measurement by yourself.

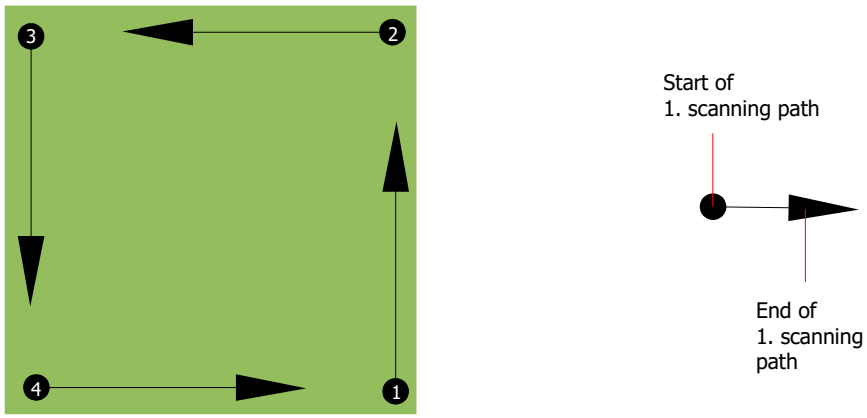


Figure 8.1: Starting position of a scan area

The scanning paths may be referred as "Zig-Zag" or "Parallel" traverses. Also the number of impulses (measure points), which are recorded during one scanning path can be adjusted individually depending on the size of your scan area (length of scanning path).

8.1.1 Scan Mode

There are two general techniques to surveying an area with the 3D Ground Navigator:

- **Zig-Zag**
  The starting position of two scanning paths next to each other is on the opposite side of the measured area. You will record data on your scanning path and on the return path as well.
- **Parallel**
  The starting position of two scanning paths is always on the same side of the measured area. You will only record data in one way and in one direction, while you should return and walk back to the starting position of the next scanning path without recording data.

Figure 8.2 represents both techniques schematically.

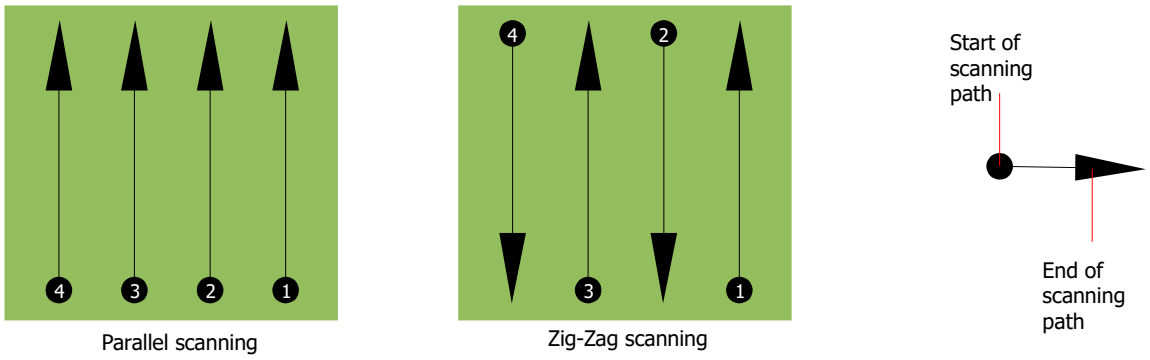


Figure 8.2: Scan modes to measure an area

Doing the scan in "Parallel" mode you will start on the bottom right corner of your scan area (point ❶) to walk and record a scan path towards the upper right corner of the area. After recording the first line, you should walk back to the starting point and move to the left of the first scan line to start the scan path 2 (point ❷), to start there the second scanning path. In this way all other paths will be scanned, until you have reached the left side of your measure area.

Doing the scan in "Zig-Zag" mode you will start also from the bottom right side of your measure area (point ❶) to walk and record a scanning path towards the right upper corner of the measure area. Different from the parallel measurement, you should continue recording data while walking back the second scanning path. So you go to the starting point of the second scanning path (point ❷) and scan in the opposite direction. In this way, all other paths will be scanned in the scan mode "Zig-Zag" until you have reached the left side of your measure area.

The distance between the scanning paths should be consistent during one measurement but can vary from measure area to measure area. If you mostly look for smaller targets than you should also select a smaller distance between the lines. A standard rule is: The smaller the distance between the paths, the more accurate your scans will be. When you are conducting your first scans the lines should not be to close together to locate possible targets.

8.1.2 Regulation of the number of impulses per scanning path

It is possible to select the number of impulses before starting the measurement or selecting the automatic mode ("Auto") to adjust the number of measure points after finishing the first scanning path.

When the number of measure points has been configured, the device will stop automatically when this number has been reached and waits for the start of the new scanning path.

In the automatic mode you should stop the measurement of the first scanning path by yourself, by pressing the appropriate button, as soon as you have reached the end of the first scanning path. This effective amount of measure points will be used for all further scanning paths of this measurement. Starting from the second scanning path, the device now stops automatically after the assumed number of impulses has been reached.

Keep in mind the number of impulses which you have recorded per scanning path. This amount should be entered later in the software program, when transferring the data to a PC, to receive all measured data correctly from your measuring instrument!

There is no special rule for selecting the right number of impulses. But there are different aspects which should be considered. These are some considerations

- the length of your measured area and
- the size of the objects you are searching for.

A preferable distance between two impulses is about 15 cm to 30 cm. The smaller the distance between two impulses is, the more exactly the graphical representation will be. If you are looking for small objects you have to select a smaller distance, for big objects you can increase the distance between the impulses.

Figure 8.3 shows the effects of the distance and the number of impulses per scanning path for some objects.

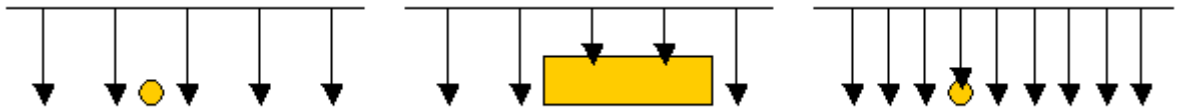


Figure 8.3: Effects of changing the number of impulses and their distance

Figure 8.4 shows the difference between very few impulses (left side) and much more impulses (right side) on the same length of scanning path. Therefor the second record (right side) shows much more details and also smaller objects can be seen.

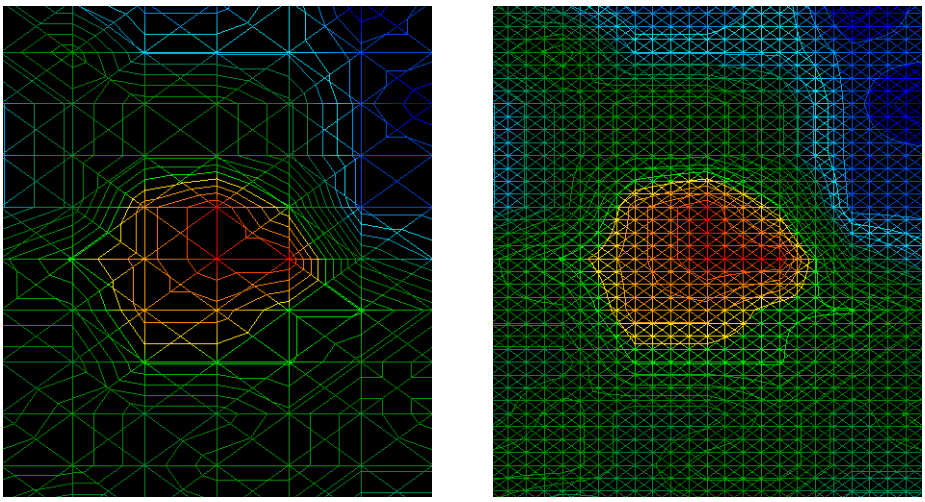


Figure 8.4: Comparison of low and high number of impulses

Do not hesitate to record more measurements with different numbers of impulses. For example you can scan a large area before doing a second detailed precision measurement. Especially if searching for

bigger objects you can proceed like this. With this manner you can measure a larger area very quickly and afterward you make new scans localizing the suspect targets.

When conducting a scan it is important to not only make note of how many impulses are being used but to get a clear picture of what you are scanning, it is very important to watch your speed. Every scan line should be measured at the same speed as the previous line.

Figure 8.5 shows what can happen, if you walk at different speeds during your scan.

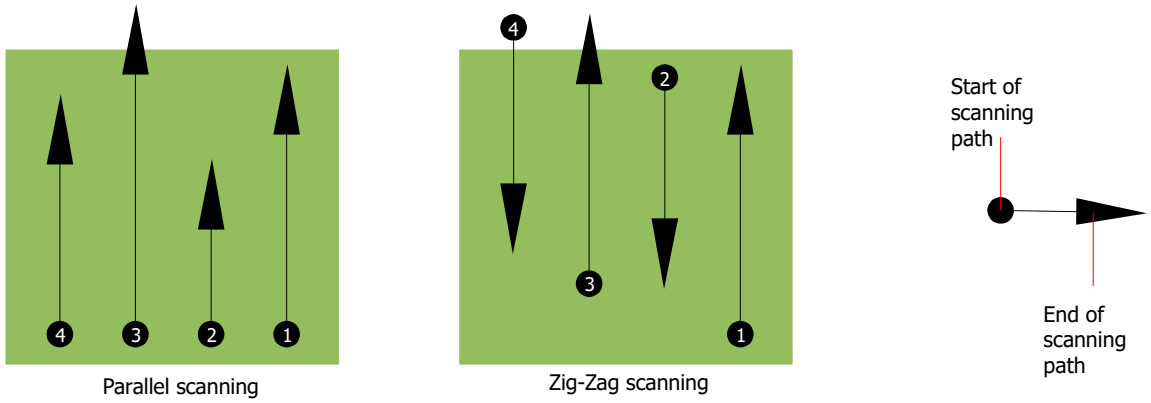


Figure 8.5: Different walking speeds during scanning

Using a different walking speed in the scanning paths, will cause displacements in the scanning path. As a matter of fact, a target can get cut into several smaller items or completely lost because it was missed. Later when the data is downloaded for further analysis, speed errors can make a target completely unidentifiable and may be discarded.

In general, the following rule is valid: Keep scans at practical sizes where you can see the beginning and stop lines and can comfortably traverse an area to keep your speed and the distances reasonable.

8.2 Special advices for field procedure

There are some aspects which you should take note of when conducting scans. In principle, a scan is only as good as the path that was taken. Making errors while scanning will show up in the final graphical representation also as an error. This will cause frustration and lost time.

Before you start with a measurement in the field, you should think of what you are looking for and if the selected area is suitable. Measuring without a plan usually will produce unacceptable results. Please consider the following advice:

- What are you looking for (graves, tunnel, buried objects, ...)? This question has direct effects on how a scan is conducted. If you are looking for larger targets, the distance between the single measure points and scanning paths can be larger, as if you are looking for small targets.
- Inform yourself about the area, where you are searching. Does it make sense to detect here? Are there historical references which confirms your speculation? What type of soil is on this area? Are there good conditions for data recording? Is it allowed to search at this place (e.g. private property)?

- Your first measurement in an unknown area has to be large enough to get representative values. All further control measurements should be adjusted individually.
- What is the form of the object you search? If you are looking for an angular metal box, the identified object in your graphic should have a form according to this.
- To get better values concerning depth measurements, the object has to be in the center of the graphic, which means it has to be framed by normal reference values (normal ground). If the object is on the side of the graphic and not totally visible an estimated depth measurement is not possible and also measurement of size and form are limited. In this case, repeat the scan and change the position of your scan area, to receive an optimal position of the anomaly inside of the graphic.
- There should not be more than one object in a scan. This will influence the depth measurement. It is useful to scan partial areas over such targets.
- You should do at least two controlled scans to be more sure about your results. This is also important to recognize areas of mineralization.
- Most important rule when dealing with mineralization. **REAL TARGETS DON'T MOVE!** If your target moves then it is most likely mineralization.

8.2.1 Orientation of probe

During one measurement the probe should have always the same distance to the ground. Generally we recommend a height of about 5 – 15 cm from the surface of the ground if possible.

In the event that you are going to go over stones, wood or high grass that is higher, start your scan with the sensor higher right from the beginning. In circumstances like these, then perhaps you will need to start the scan with the probe at a height of 2 feet (50 cm) and keep it at that level for the entire scan. It is important to maintain the height, this will eradicate many errors. As a rule, do not change the height during a scan for it may create unnecessary errors.

Another important aspect is the physical orientation of the probe. During the "Parallel" scan mode the orientation of the probe does not change because you are always measuring in the same direction. Even in the "Zig-Zag" scan mode the orientation of the probe must not be changed. That means you are not allowed to turn yourself with the device and the probe at the end of the scanning path. Instead you should walk backwards and continue scanning. Otherwise your obtained graphic includes red or blue stripes. These stripes throughout a scan are commonly referred to as “Rotational Errors”.

8.2.2 Parallel or Zig-Zag?

For skilled users of the 3D Ground Navigator both scan modes are suitable. According to experience the best graphics has been received in the "Parallel" mode, because you are starting at the same point and traveling in the same direction. It is also easier to control your walking speed.

Especially in uneven territories like mountain sides, acclivities or other inclined layers the parallel mode is preferred. When it comes to speed, the experienced user will very often use the Zig-Zag mode for the initial scan to determine if there are anomalies in the area worth further research.

8.2.3 Manual or automatic impulse mode?

Large even or passable surfaces are commonly measured in the automatic mode. The manual impulse mode is mostly used for difficult uneven terrain, areas where there is quite a bit of growth and if the measurement result needs to be very accurate.

In terrains with difficult access like mountain cliffs and sides, slippery surfaces or overgrown areas, it is wise to use the manual impulse mode. Because each impulse will be released manually, you have enough time to position the probe in the correct way and record the measured value. In this way, you can also measure accurately previously marked dots of a predefined grid.

8.2.4 Tips from the trainers themselves

When conducting scans, there are some extremely important items that need to be noted. First of all it is crucial that you relax. When you are tense, you are putting too much pressure on yourself to do the scan correctly; often resulting in errors.

- Newly buried targets are difficult to see. Many users receive the equipment and the first thing they do is go out and bury an object. When an object goes into the ground it changes the natural signature of the soil and creates some kind of noise. Usually the buried object has a weaker signature than the unnatural noise and therefor is not detectable. So taken scan images will not show the buried item but visualize the noisy area in blue colors. After the item has been seasoned, meaning it has been in the ground for a complete cycle of seasons (usually a year), the noise gets reduced and the signature of the buried object becomes visible again.
- Train on known targets. In the training course at the factory we have several objects that have been buried for years, just like real targets in the field. These targets can be quickly and easily identified because they are not natural to the soil. Other targets that you can use in your own area are buried utilities. Pipes, tanks, electrical, sewers, graveyards, etc... Most of these items can be found in every community, town or city. This is where you need to begin your training if you are going to self-train.
- Get professional training. When you take advantage of receiving the training, either from the factory or a qualified dealer, you will understand not only the use and operation of the OKM detector but also the software so much easier and be able to identify targets as well as errors.
- Do not rely on just one scan measurement. So many users go out into the field and they make a measurement and see a target. Instead of repeating the scan and reproducing it several times, they go out and get a shovel and dig. On very rare occasion will the first scan be perfect. Even the trainers do multiple scans to ensure that they are not looking at areas of mineralization or an error.

- Soil Mineralization – Oh! Very frustrating! We will all experience it. When you are in an area that is known to have pockets of mineralization, be prepared to conduct more scans than normal.
    - Clay is probably the number one foe. Depending on the iron content of the clay will determine how strong the attenuation will be. A quick rule of iron content is how dark it is, it can vary from a light gray up to a dark orange. The darker the more iron it will have in it.
    - Sand is usually very clear and easy to hunt in. There are two factors of sand that need to be noted. Sand where the ground water is very shallow, meaning that the ground water is usually just a couple of meters from the surface or desert sand where it is very arid. In desert sand, the targets can be situated 3x deeper than indicated.
    - Farmland is another area to take note of. In modern farms, so many nutrients and fertilizers are introduced creating an unnatural area of mineralization.
    - Rocky mountainous areas. Areas with many mountains are also riddled with patches of mineralization. Mountainous areas are created from faults in the earth and this is probably the biggest area for natural treasures as well as mineralization.

Chapter 9

Tutorial

This chapter gives a detailed step-by-step procedure, which explains the process of a measurement by means of some selected examples.

9.1 Automatic measurement in Zig-Zag mode

Figure 9.1 represents a typical measure area which should be scanned with the 3D Ground Navigator. The red frame marks the borders of the measure area. For this example we are using the following parameters:

- **Impulse Mode:** "Automatic"
  Automatic impulse mode, which records measure values (impulses) of a scanning path without any interruption.
- **Impulses:** "Auto"
  Automatic determination of the impulses, which means the number of impulses will be defined during the first scanning path.
- **Transfer Mode:** "Memory"
  Storage of measured data in the internal memory of the device. After finishing the measurement the data has to be transferred to the computer by using the operating mode "Transfer Memory To PC".
- **Scan Mode:** "Zig-Zag"
  The measure area is even and easy to access, that is why we have selected the scan mode "Zig-Zag".

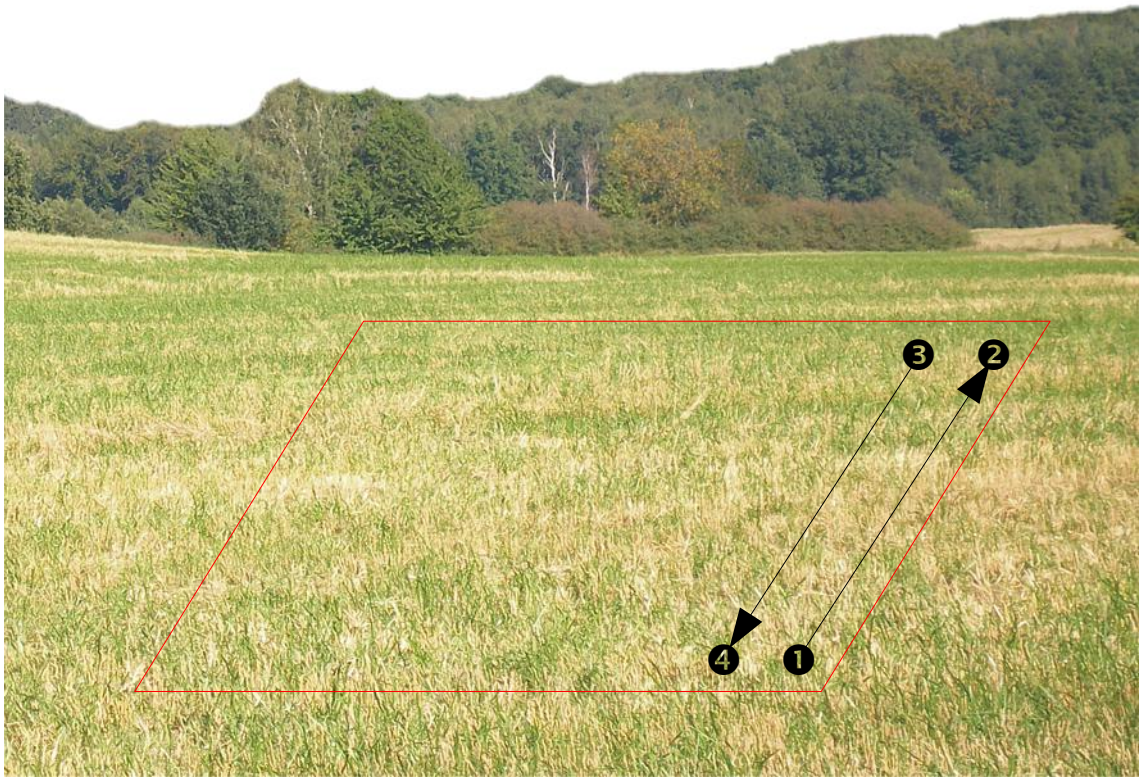


Figure 9.1: Measure area for a survey in mode "Ground Scan"

Now go to the start position ❶ of your measure area and power on the device by pressing the power on/off button. Put on the headphones and power them on, so you can hear the acoustical signals of the impulses. On the display you can see the main menu showing the operating mode "Magnetometer". Press one time on the button ➔, to select the operating mode "Ground Scan". Confirm your selected operating mode by pressing the **OK** button. Now you can see the selection menu of the impulse mode *(Impulse Mode*). It is already set on "Automatic". Confirm this selection by pressing the **OK** button.

The next parameter is the number of impulses *(Impulses*). The default setting is "20". Press two times the arrow key ➔, to select "Auto". Confirm your selection by pressing the **OK** button.

The last parameter is the method of data transfer (*Transfer Mode*). The default setting is "Memory". Confirm your selection by pressing the **OK** button.

The device is now ready to start the first scanning path. The display shows the message *"Press Start, L:1, I:0/?"*. The question mark "?" shows that the number of impulses per scanning path has not been defined yet. As soon as you press the start button the measure values will be recorded continuously. You will hear the acoustical signals via the integrated speakers or the headphones. On the basis of these acoustic signals you can coordinate your walking speed. After pressing the start button you should walk slowly and equally forward to point ❷ of the measure area and press again the start button so that you do not hear any more impulses. The device is now in stand-by position. On the display you can now read the automatic defined number of impulses per scanning path. For example there can be the following message written in the display "*Press Start, L:2, I:0/25"* . Here 25 impulses has been defined.

Now you should go to the start position of your second scanning path (point ❸). Press the start button and walk with the same speed like the first scanning path to the end of your second scanning path (point ❹). This time it is not necessary to press again the start button at the end of the scanning path. The device will stop automatically when it has recorded the same number of impulses like in the first scanning path.

Continue the measurement with the next few scanning paths until you have scanned the complete measure area in the scan mode "Zig-Zag". When you have reached the end of the final scanning path, press one of the arrow keys ➔ or ➔, to finish the measurement and go back into the main menu.

When leaving the operating mode "Ground Scan" you should keep in mind the number of impulses which you have used per scanning path! This value you should enter when transferring the data to the software!

In this moment the recorded data of your measure area is saved in the internal memory of your device and should now be transferred to a computer for evaluation.

9.2 Transfer internal memory to computer

The data of your last measurement are saved in the internal memory of the device. Before you can evaluate these measurement values graphically you should transfer them to a computer. The following section explains how you can transfer the saved measure values from the internal memory to the delivered software "Visualizer 3D".

9.2.1 Prepare software "Visualizer 3D"

Before you can transfer any measured data you should prepare the "Visualizer 3D" software for a data reception. Plug in your USB cable into a free USB port of your computer and the other end into the USB port of the control unit. Now start the program "Visualizer 3D".

When the software is open, click on the menu item **File → New** and set up the parameters according to your previously recorded measurement!

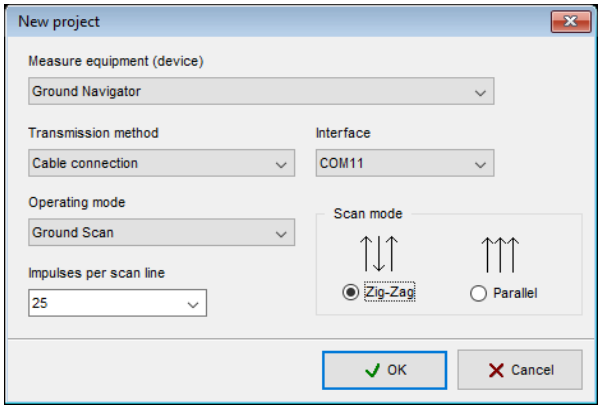


Figure 9.2: Preparation of a new data transfer in "Visualizer 3D"

Select your measure instrument "3D Ground Navigator" from the list.

As transmission method you should select "Cable connection" and at the entry "Interface" define the correct COM port at which the USB cable has been installed. Please also read the chapter 2 ("Install/Uninstall USB drivers on Windows") on page 13! If you are using a preconfigured laptop you can find the correct number of the used COM port on the attached sticker.

As operating mode you should select "Ground Scan" and enter in the space "impulses per scan line" the recorded number of measure points per scanning path. In our example we have used 25 impulses. Now you just have to select the scan mode, so that the computer can receive the data correctly. Therefore you should mark the entry "Zig-Zag" and click on the button *OK*.

9.2.2 Establish USB connection and transfer data

After having prepared the software "Visualizer 3D" to receive data, you should establish an USB connection between the 3D Ground Navigator and the computer. Power on the control unit and select the operating mode "Transfer Memory To PC" with the arrow keys ← and →. Activate the selected operating mode with the **OK** button and wait until the device establishes a connection to the computer.

When the USB connection is established successfully press the start button on your measure instrument.

Now all measured data will be transferred and a graphical representation will appear in the "Visualizer 3D" software. Now click inside the software on **File → Stop**, to finish the data transfer to the software.

9.3 Manual measurement in parallel mode

In figure 9.3 the measured area is represented again. In our second example it should be scanned with the following parameters:

- **Impulse Mode:** "Manual"
  Manual impulse mode, where the measure values (impulses) of a scanning path should be released manually. The device waits after each measure point for the user to release the next impulse.
- **Impulses:** "30"
  Predefined fixed number of impulses, which means that the number of impulses should be exactly 30 within the 1. scanning path and all following scanning paths.
- **Transfer Mode:** "Computer"
  Direct transfer of measured data to a computer. Before starting the measurement a connection between device and computer via USB should be established.
- **Scan Mode:** "Parallel"
  The measure area is even and easy to walk but it is also possible to select the scan mode "Parallel".

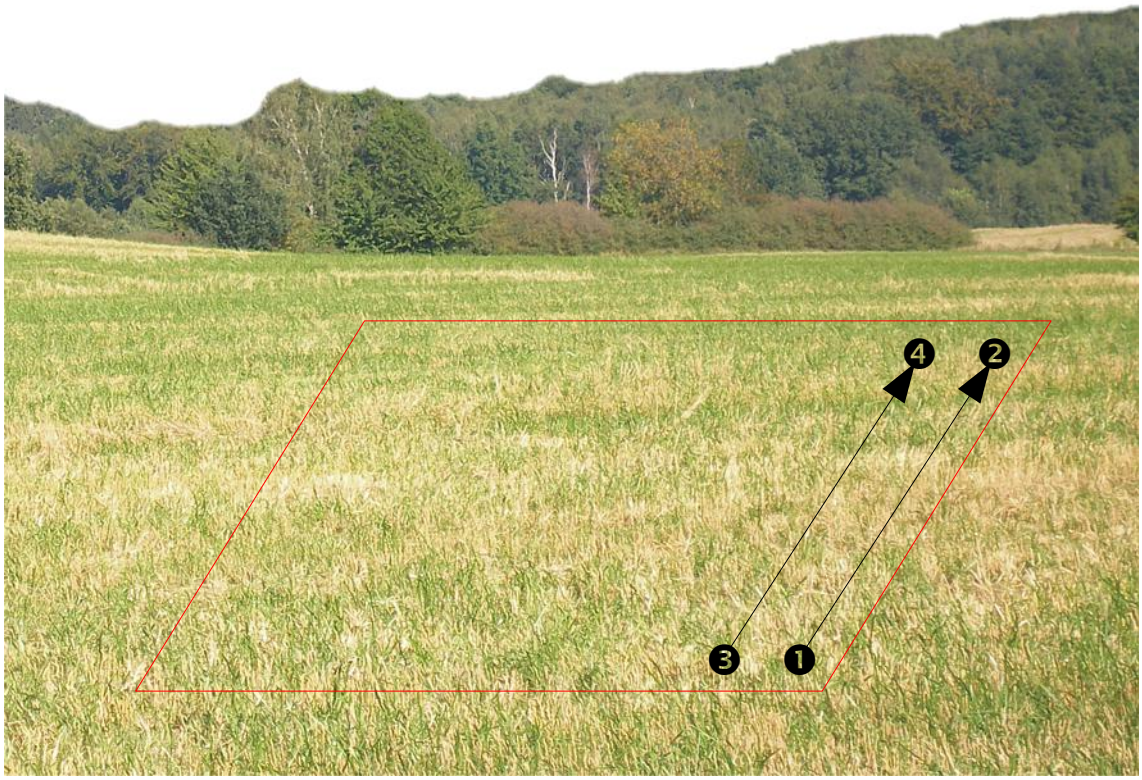


Figure 9.3: Measure area for a survey in mode "Ground Scan"

Because all measured values will be transferred directly to the computer while scanning, you should at first prepare the software to receive data.

9.3.1 Prepare "Visualizer 3D" software

Plug in the USB cable into a free USB port of your computer and the other end of the cable into the USB port of the control unit. Now start the "Visualizer 3D" software.

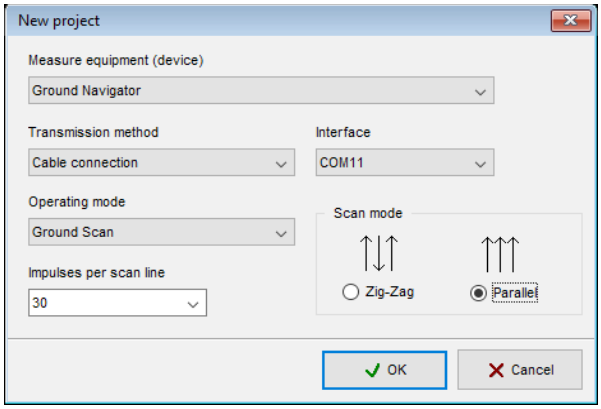


Figure 9.4: Preparation of a new data transfer in "Visualizer 3D"

When the software is open, click on the menu item **File → New** and set up the parameters according to your planned measurement!

Select your measure instrument "3D Ground Navigator" from the list.

As transmission method you should select "Cable connection" and at the entry "Interface" define the correct COM port at which the USB cable has been installed. Please also read the chapter 2 ("Install/Uninstall USB drivers on Windows") on page 13! If you are using a preconfigured laptop you can find the correct number of COM port on the attached sticker.

As operating mode you should select "Ground Scan" and enter in the space "impulses per scan line" the number of measure points which you plan to use for each scanning path. In our example we will use 30 impulses. Now you just have to select the scan mode, so that the computer can receive the data correctly. Therefore you should mark the entry "Parallel" and click on the button *OK*.

9.3.2 Establish USB connection

After having prepared the software "Visualizer 3D" to receive data, you should establish an USB connection between the 3D Ground Navigator and the computer. Power on the measure instrument with the power on/off button. After that you will enter into the main menu where the first operating mode "*Magnetometer*" is visible. Press one time on the arrow key ➔, to select the operating mode "Ground Scan". Confirm the selected operating mode by pressing the **OK** button. Now you entered into the selection menu *Impulse Mode*. The default setting is "Automatic". Press the arrow key ➔, one time to change to "Manual". Confirm the setting by pressing the **OK** button.

As the next parameter you should select the number of impulses (*Impulses*). The default setting is "20". Press one time the arrow key ➔, to select "30". Confirm this setting by pressing the **OK** button.

The last parameter is the method of data transmission (*Transfer Mode*). The default setting is "Memory". Press one time the arrow key ➔, to change to "Computer". Confirm this selection by pressing the **OK** button.

The display of the device shows now the message *"Initializing USB Port ..."*. As soon as the USB connection has been established successfully you can start with the measurement.

9.3.3 Performing a measurement

Go to the starting position ❶ of your measure area, put on the headphones and power them on to hear the acoustic signals of the impulses. The display shows the message *"Press Start, L:1, I:0/30"*. As soon as you press the start button you will hear a short impulse signal.

The display now shows the message *"Press Start, L:1, I:1/30"*, which means that 1 of 30 impulses has been measured. Now do a small step forwards in direction of point ❷ and press again the start button to measure the 2nd impulse. You will hear again a short signal tone via the internal speakers or the headphones. Repeat this procedure until the device indicates you the end of the scanning path and the display shows the message *"Press Start, L:2, I:0/30"* .

Now go to the start position of your second scanning path (point ❸). Press the start button and measure the second scanning path in the same way like the first scanning path. Continue your measurement for all other scanning paths until you have scanned the complete area in the scan mode "Parallel". When you have reached the end of the final scanning path press one of the arrow buttons ➔ or ➔, to finish the complete measurement and return into the main menu.

While measuring the ground all data has been transferred at the same time to the computer and a graphical representation has been created inside the "Visualizer 3D" software. Now click on **File → Stop**, inside the software program to finish the data transfer to computer.