FS Future Serie®

# eXp 5000

User's manual

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# 1 Preface

Dear customer,

in the first instance we want to thank you that you made your decision on a product of OKM Ortungstechnik GmbH.

With the eXp 5000 you purchased a product which is based on a electromagnetic pulse method which can be used to locate anomalies in the target area. Thus the device is able to detect natural features such as formations of strata, cavities, groundwater level as well as sepulchers or buried objects such as pipes, tanks, boxes or suchlike.

The eXp 5000 is able to locate, to document and to analyse buried objects with different structures, without making necessary any excavation. Particularly in areas next to the surface there are many advantages to geoelectric, seismic and magnetic procedures and it is further more a usefull complement to these methods. The eXp 5000 has a facile and flexible handling and provides fast and easy 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.

Of course by selling our products we cannot guarantee that you really make a find during your research. The recognition of hidden objects and structures depends on a hugh number of factors - like you know. Determining factors are the dielectricity constant of the ground, the grade of mineralisation and the dimensions of an object relating to its depth. Specially in very wet soil, clay and sand with high conductivity of the ground, recording of the measured results can be falsified strongly.

With this product you purchased a device which stood the tests in regular operation like all other products of us. If you are interested in where our devices have gone into action please visit our homepage.

For our company it is necessary that we protect our developments within the framework of existing legislation to a patent or trademark registration. Therewith we offer you a higher warranty while using our products.

Please take your time consecutively, read this user‘s manual and familiarize yourself with the utilisation and operation of this eXp 5000.

# 2 Important Notes

Please read these operating instructions carefully and closely before using *eXp 5000* and its accessories! These instructions give information on how to use the device and point out potential sources of danger.

*eXp 5000* and its accessories serves for documentation and analysis of detect objects deposited and changes performed in the ground. The registered data of the ground structure will be transmitted to a PC for visual representation in a special software program using the components we offer. Any additional notes relating to this has to be observed. Please read attentively the manual according to the software you are using!

## 2.1 General Notes

Being an electronic device, *eXp 5000* has to be treated with the caution and care necessary when such devices are used. Any failure to observe the safety precautions given or any use for purposes other than the ones it is conceived for may result in a damage or destruction of the processing unit and connected components.

The device will get destroyed if it is opened improperly.

## 2.2 Possible Health Hazards

If used properly the 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.

## 2.3 Surrounding Area

Having been transferred from a cold to a warmer place, the device should not be operated immediately afterwards. Any condensation, which may have formed, might cause the device to get destroyed. Avoid strong magnetic fields, which may occur in places such as near machines or loudspeakers, and avoid using a detector within a radius of 50 meters.

Metallic objects on the ground such as cans, doses, catches, nails, screw or others can influence negatively your measurement and have to be removed. Also you have to remove keys, telephones, chains and rings and all other magnetic and metallic objects from yourself.

## 2.4 Voltage

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

*Never use the 230 Volt mains supply.*

## 2.5 Data safety

There can be errors in the process of data collection if

- the range of the sender module is been exceeded,
- the power supply of the device is to low,
- the cables you are using are to long,
- other electronic devices sends out disturbances or
- atmospherics occurs (lightnings, . . . ).

# 3 Technical Specifications

The following technical indications are medial values. During operation small variations are quite possible.

## 3.1 Control Unit

| | |
|---|---|
| Dimensions (H x W x D) | 75 mm x 130 mm x 177 mm |
| Weight | about 1 kg |
| Voltage | 9.6 - 14.4 VDC |
| | 22 W maximal |
| Safety Class | IP40 |
| Operating Time (Full Charged Battery, Delivered Power Supply, 25 ℃) | about 3 hours |
| Operating Temperature | 0 ℃ - 40 ℃ |
| Video Eyeglasses | 640 x 480 Pixel, Color |
| Computer | 1 GHz Processor |
| | INTEL i586- compatible |
| Working Momory | 256 MB RAM |
| Data Memory | 256 MB |
| Feedback | accustic, visual |

Table 1: Technical Specifications (Control Unit)

## 3.2 Data Transmission

| | |
|---|---|
| Technology | USB |
| Maximal Data Transmission Rate | 19200 Baud |

Table 2: Technical Specifications (Data Transmission)

## 3.3 Computer, Minimum Requirements

The computer is not part of the scope of delivery. The indicated values should help you for a correct selection of a suitable computer for analysis of your measured results.

| | |
|---|---|
| Processor | minimum 1500 MHz |
| CD-ROM Drive | minimum 4x |
| Com-Port (Data Transmission) | USB |
| Free Memory | minimum 20 MB |
| Working Memory (RAM) | minimum 128 MB |
| Graphic Card | minimum 64 MB, OpenGL-compatible |
| Operating System | Windows XP, Windows Vista |

Table 3: Technical Specifications (Computer, Minimum Requirements)

# 4 Scope of Delivery

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

| | |
|---|---|
| 1 | Control unit incl. carrying strap |
| 1 | Video eyeglasses with integrated headphones |
| 1 | Telescopic rod assembly for GPR antenna |
| 1 | External power supply with cable |
| 1 | Charger for external power supply |
| 1 | GPR antenna 50 cm |
| 1 | GPS antenna |
| 1 | User manual |
| 1 | Carrying case |
| 1 | 3D Software (Visualizer 3D) |
| 1 | USB cable |
| 1 | GPR antenna 25 cm [optional] |
| 1 | GPR antenna 75 cm [optional] |
| 1 | GPR antenna 100 cm [optional] |
| 1 | Antenna for tunnel detection [optional] |
| 1 | Super sensor [optional] |
| 1 | Antenna for metal discrimination (DDV system) [optional] |
| 1 | Livestream sensor [optional] |
| 4 | VLF emitter [optional] |
| 1 | FS-Thermoscan [optional] |

Table 4: Scope of delivery

Beware that pictures in this manual could be different to delivered parts.


Figure 1: Scope of Delivery

# 5 Assembly

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

Figure 2: Assembly and Connection of Probe

Figure 2 shows how to assemble the standard horizontal probe to the linkage. Therefore just put the probe into the appropriate attachment of the linkage. Then connect the probe cable with the control unit. Do it without any unnecessary application of force! The vertical probes can be used without linkage. You can simply hold it in your hand perpendicularly to the soil.


Figure 3: Connection of External Power Supply

Figure 3 shows how to connect the external power supply to the control unit. The cable is placed inside a storage case on the back side of the battery and is wired to this power supply. While connecting the external power supply take care to connect at first the cable with the control unit. The external power supply has to be powered on afterwards.

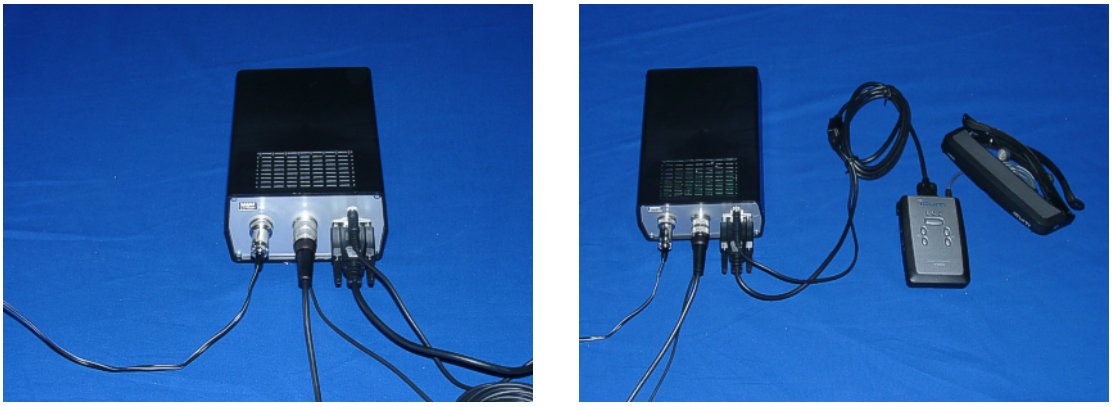


Figure 4: Connection of Video Eyeglasses

Figure 4 represents the connection of the video eyeglasses. Plug in both connectors of the video eyewear into the correct connection of the control unit.

Figure 5: Connection of the USB Data Cable

Figure 5 shows how to plug in the USB connection cable to the computer. Further information about the use and installation of the USB driver you can find in section 6 on page 17.


Figure 6: Connection of the Detector Unit

Figure 6 shows how to assemble the detector unit on the control unit. You can plug in the unit on the according linkage of the top side of the control unit without any application of force.

# 6 Install/Uninstall of USB drivers

Before you can transfer data from the device to your computer you have to install the USB drivers. Connect the active computer and the control unit via USB cable and follow the instructions in the appropriate subsection.

## 6.1 Windows XP

The instructions in this section are only valid for the operating system Windows XP. If you are using Windows Vista as operating system of your computer, please read the instructions in section 6.2 on page 23!

### 6.1.1 Install drivers

The installation of the USB drivers in Windows XP is relatively simple. After you have connected the device with your computer, powered it on and the message from figure 7 appears on your screen.


Figure 7: Install USB drivers: Windows XP, Step 1

If you prosecute Windows XP with Service Pack 2, you will be asked in dialog from figure 8 if Windows Update has to search for drivers up to date. Mark entry *No, not this time* and click on *Next*.

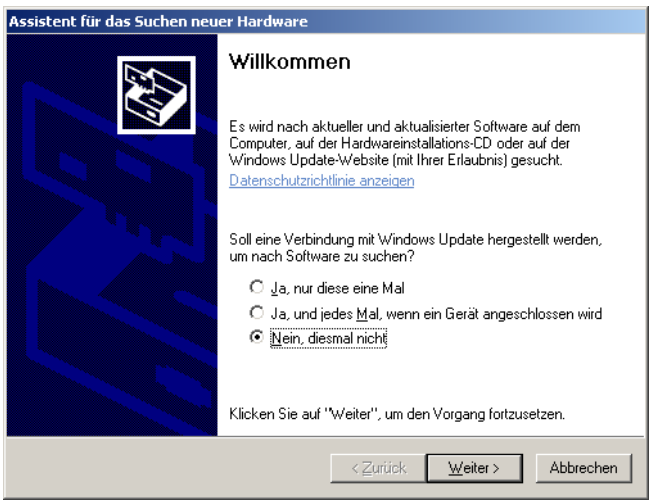



Figure 8: Install USB drivers: Windows XP, Step 2

In other versions of the operating system Windows this dialog window should not appear.

In the following dialog window like figure 9 select the entry *Install software from a list ...* and click on button *Next*.

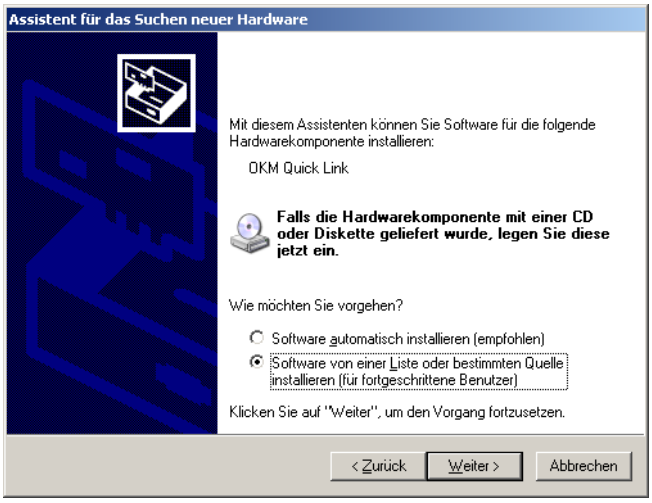



Figure 9: Install USB drivers: Windows XP, Step 3

In the next dialog window from figure 10 mark the entry *No search, select driver individually* and click on *Next*.

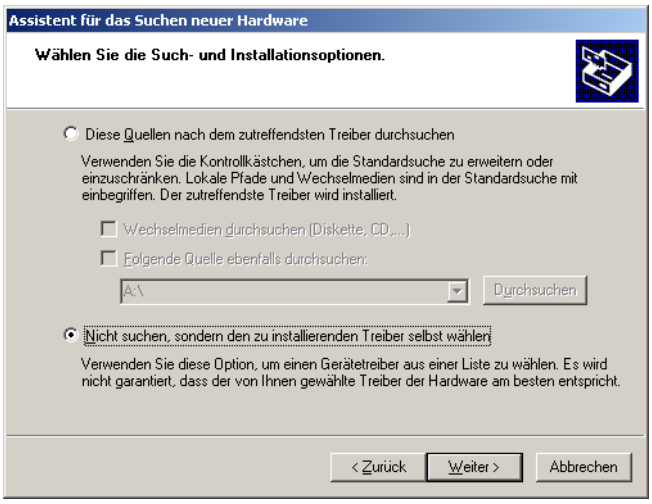



Figure 10: Install USB drivers: Windows XP, Step 4

Another window will open, represented in figure 11, 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.

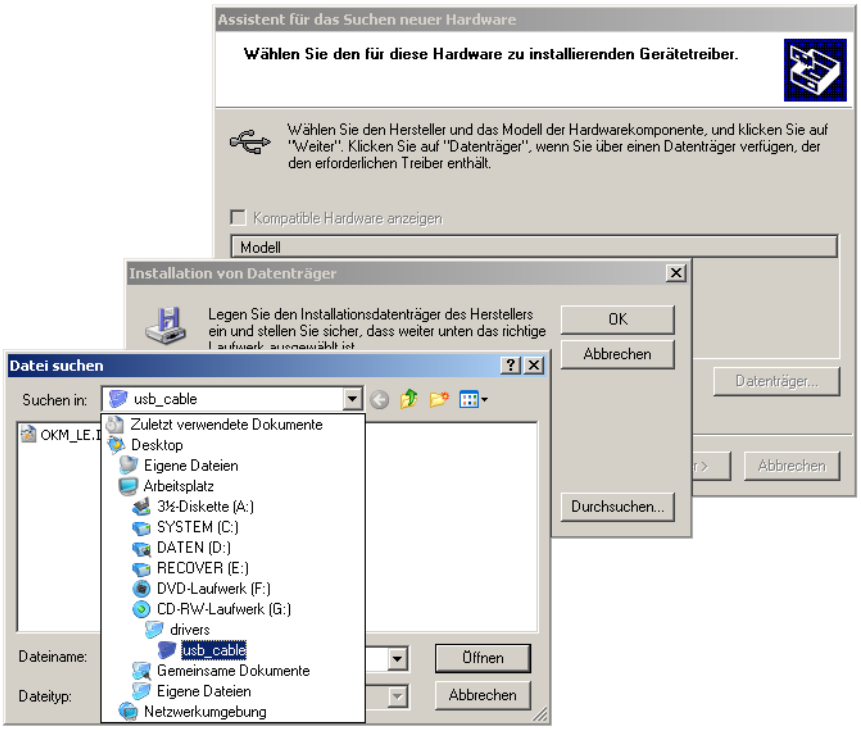



Figure 11: Install USB drivers: Windows XP, Step 5

After successful installation of the driver a message like in figure 12 will appear on your computer screen. Now the drivers of your device are installed and you can transfer data to your PC.

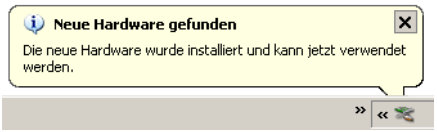



Figure 12: Install USB drivers: Windows XP, Step 6

### 6.1.2 Uninstall drivers

If you need to delete the USB drivers from your operating system because of a wrong installation for example, please open the device manager of Windows XP. Therefore please click on *Start* → *control panel*, like represented in figure 13.

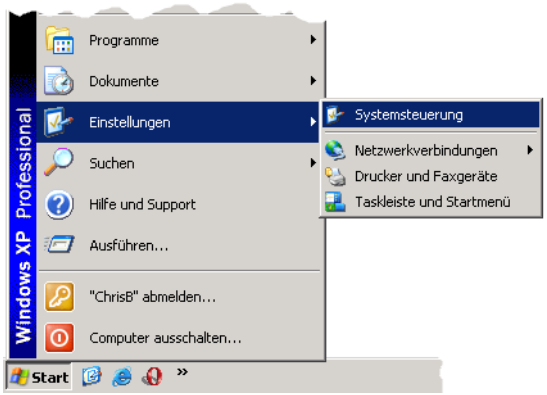



Figure 13: Uninstall USB drivers: Windows XP, Step 1

After that a dialog like in figure 14 appears. There you can find the entry *system* and click twice on it.

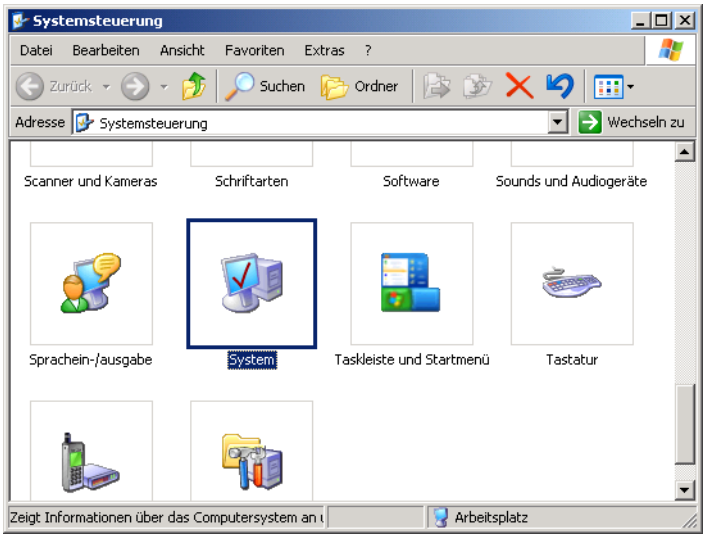



Figure 14: Uninstall USB drivers: Windows XP, Step 2

The dialog from figure 15 appears on your screen. Click on the tab *hardware* and after that the button *device manager*.

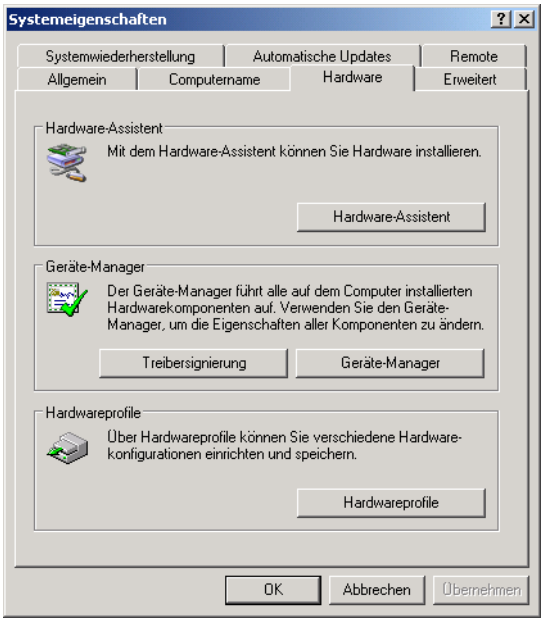



Figure 15: Uninstall USB drivers: Windows XP, Step 3

A list of devices like in figure 16 will be represented. There you can find the entry *USB-Controller*. By clicking the plus symbol next of this entry, all available USB devices will be shown.

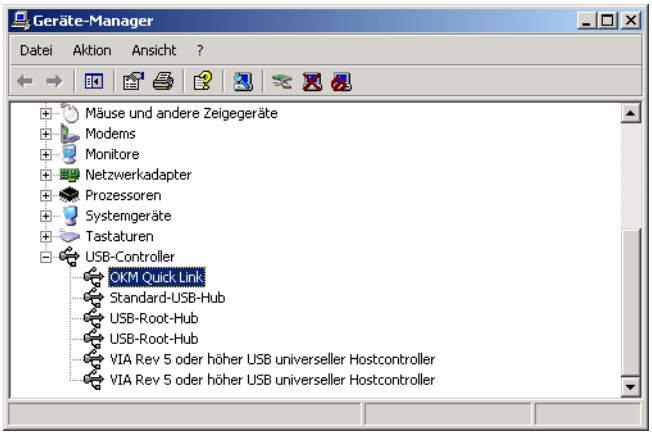



Figure 16: Uninstall USB drivers: Windows XP, Step 4

Mark the device which you like to delete, which means *"eXp 5000"*. Eventually the device can be listed as *"OKM Quick Link"*. Then click on the button . Alternatively you can select in the menu *Action* the entry *Uninstall*.


Figure 17: Uninstall USB drivers: Windows XP, Step 5

The dialog from figure 17 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 in the correct way.

## 6.2 Windows Vista

The instructions in this section are only valid for the operating system Windows Vista. If you are using Windows XP as operating system of your computer, please read the instructions in section 6.1 on page 17!

### 6.2.1 Install drivers

The installation of the USB drivers in Windows Vista is relatively simple. After you have connected the device with your computer, powered it on and the message from figure 18 appears on your screen.


Figure 18: Install USB drivers: Windows Vista, Step 1

Click on the button *Search and install driver software (recommended)*. Following the message from figure 19 appears on the screen.

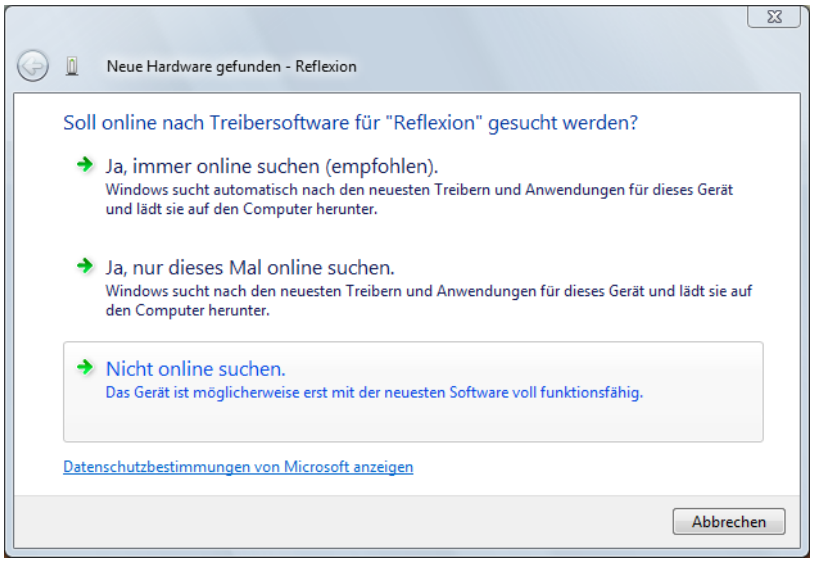



Figure 19: Install USB drivers: Windows Vista, Step 2

Click on the button *Do not search online*. Another dialog will appear on the screen, like represented in figure 20.

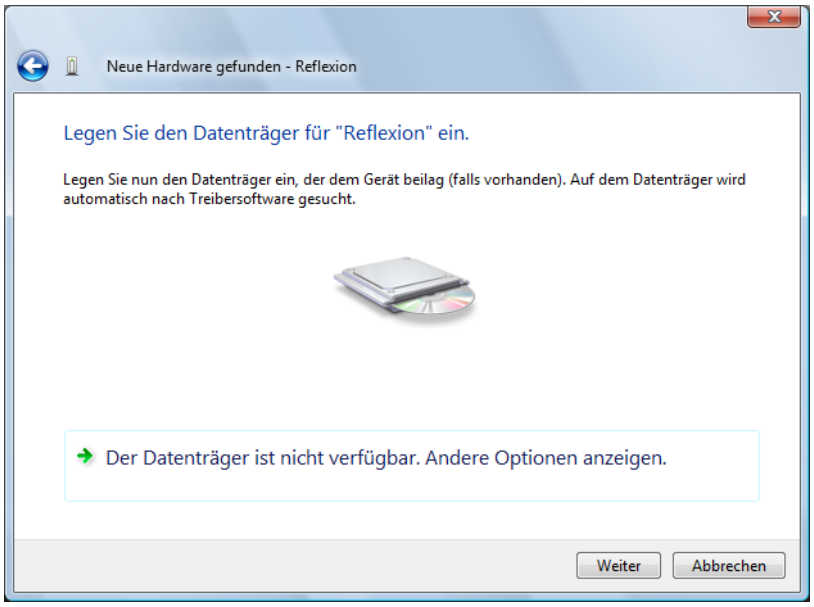



Figure 20: Install USB drivers: Windows Vista, Step 3

Now insert the software CD with the USB driver into your CD drive and click on the button *Next*. Windows is now searching for the correct USB driver in all directories. After a few moments the message from figure 21 will appear.

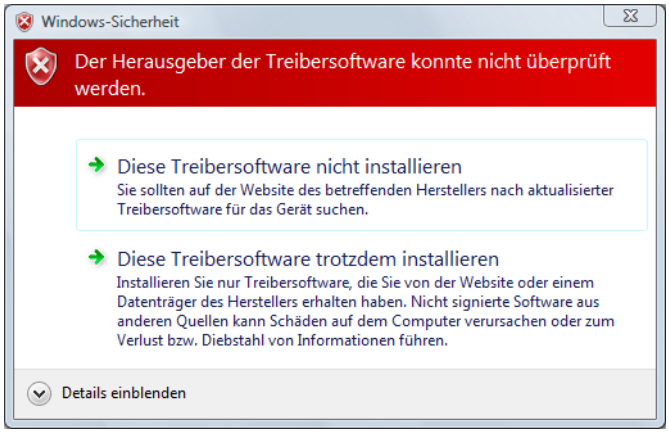



Figure 21: Install USB drivers: Windows Vista, Step 4

Click on the button *Install this driver software anyway*,to install the USB driver on your system. After completing the USB installation a dialog like in figure 22 will appear.

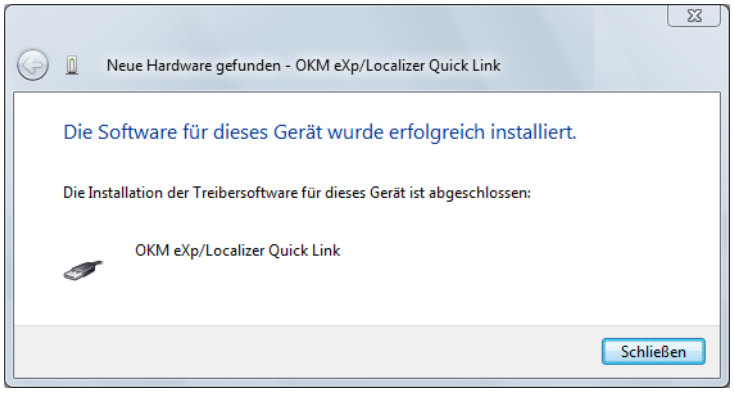



Figure 22: Install USB drivers: Windows Vista, Step 5

Additionally the information from figure 23 will appear on the down right side of your screen.

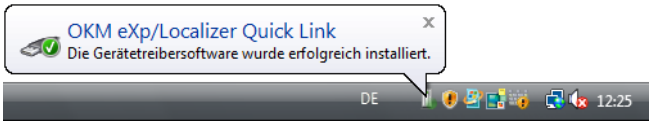



Figure 23: Install USB drivers: Windows Vista, Step 6

Now you have completed the installation of the USB drivers in Windows Vista.

### 6.2.2 Uninstall drivers

If you need to delete the USB drivers from your operating system because of a wrong installation for example, please open the device manager of Windows Vista. Therefore please click on *Start* → *control panel*, like represented in figure 24.


Figure 24: Uninstall USB drivers: Windows Vista, Step 1

After that a dialog like in figure 25 appears. There you can find the entry *system* and click twice on it.

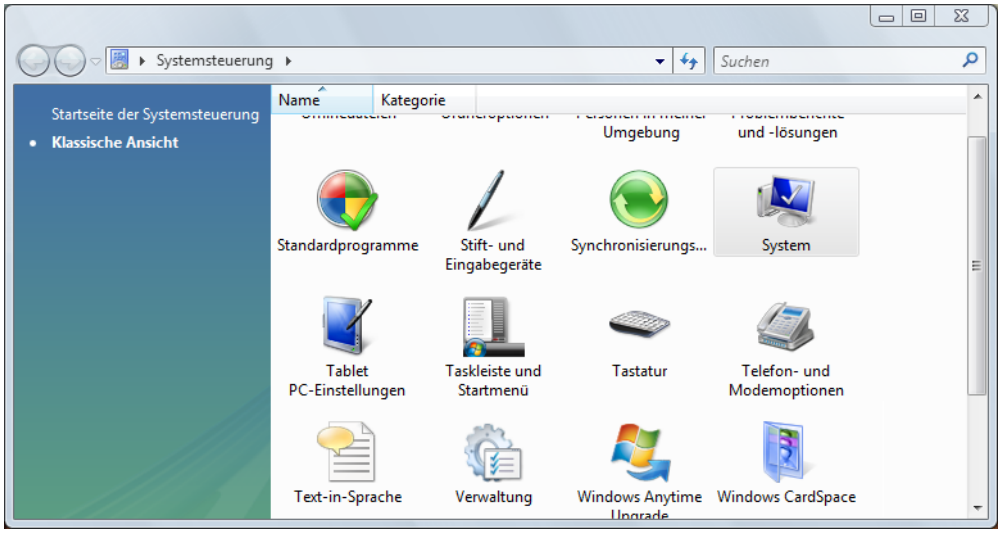



Figure 25: Uninstall USB drivers: Windows Vista, Step 2

A window like in figure 26 appears on your screen. Click there on the entry *device manager* on the upper left side.

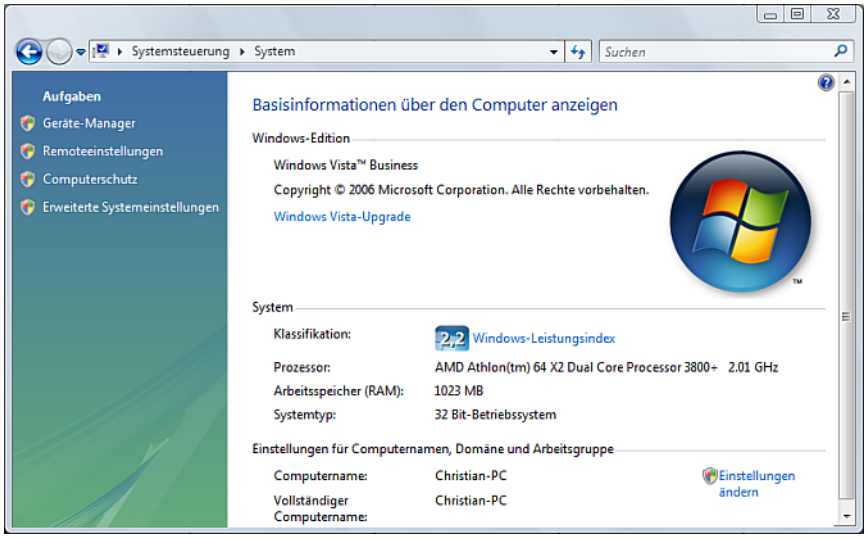



Figure 26: Uninstall USB drivers: Windows Vista, Step 3

A list of devices like in figure 27 will appear. Please look there for the entry *USB-Controllers*. By a simple click on the plus symbol next to the entry all USB devices will be shown.

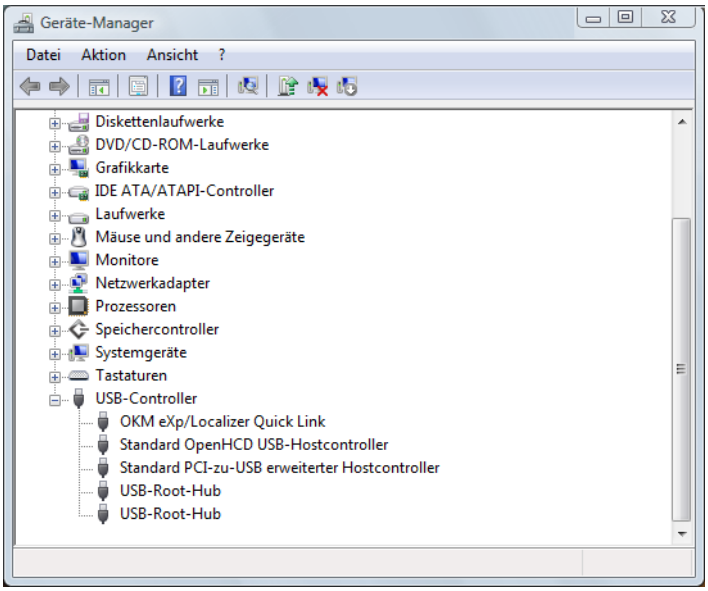



Figure 27: Uninstall USB drivers: Windows Vista, Step 4

Mark the device which you like to delete, which is *"eXp 5000"*. Eventually the device can be mentioned also as *"OKM Quick Link"*. After that click on the button . Alternatively you can select in the menu *Action* the entry *Uninstall*.

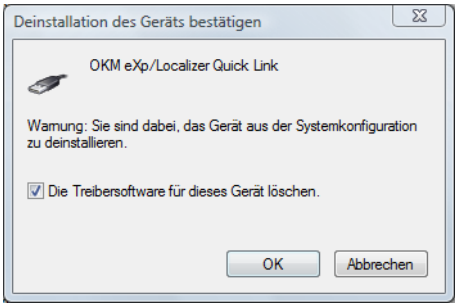



Figure 28: Uninstall USB drivers: Windows Vista, Step 5

The dialog from figure 28 will appear. Mark the entry *Delete driver software for this device* and click after that on the button *OK*. Now all drivers will be deleted from your computer. If needed you can install the USB driver now again in the correct way.

# 7 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.


Figure 29: Control unit with video eyewear, power supply and antenna

Via the Video eyewear you can see the menu navigation of the Control unit and all measurement recordings. The GPS antenna is used to receive gps data and should not be placed near to the Control unit. You can attach it to the Telescopic rod assembly or on the top of the Carrying strap.

The horizontal antennas like e.g. the GPR antenna 50 cm has to be connected via the T-mount to the Telescopic rod assembly. The vertical antennas like e.g. the Super sensor can simply be hold in the hand. In this situation it is recommended to wear the control unit with the Carrying strap.

## 7.1 Control Unit

The control unit is the calculation center of the device. Via the control unit the programs can be selected, all measured values can be recorded and stored.

### 7.1.1 Front View

Figure 30 shows the front side of the control unit with its control elements.

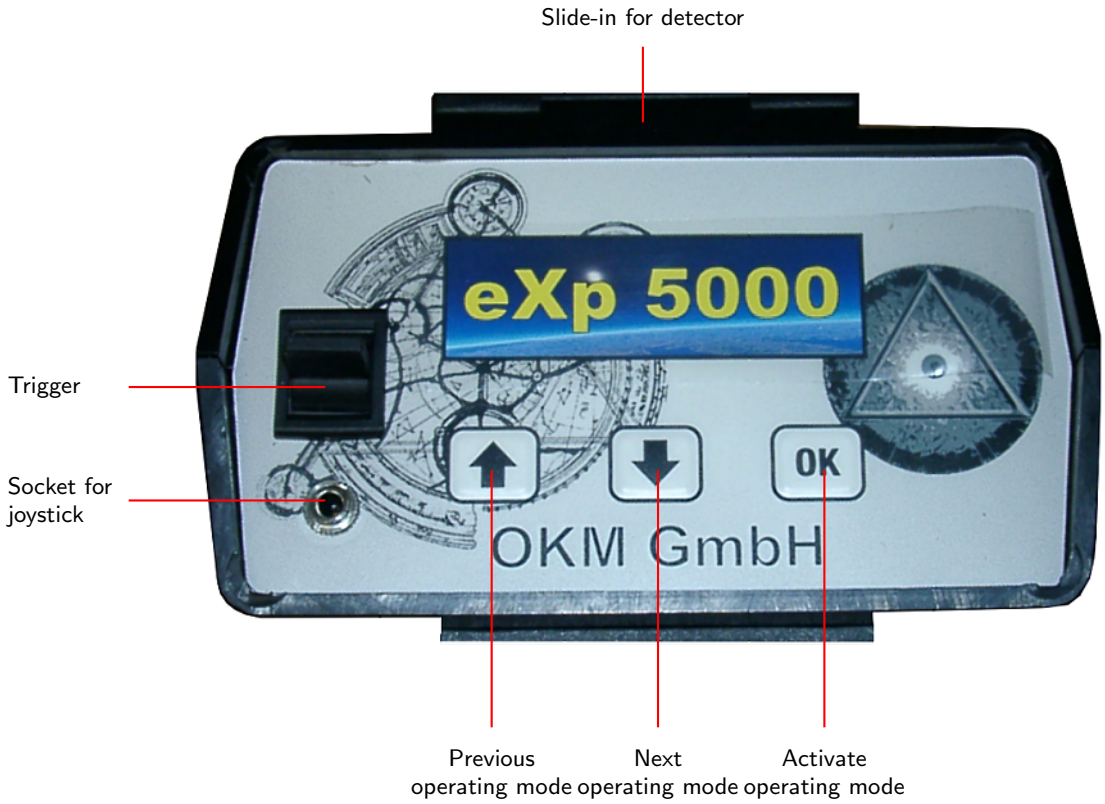



Figure 30: Control Unit, Front View

The Slide-in for detector is used to hold the DDV system. On the detector unit the fitting counterpart is connected with which the detector unit slides-in.

The Trigger is used to power on the device. Therefore it has to be pushed upwards. Before you operate your measuring instrument you have to connect the delivered Video eyewear and external power supply and power it on. During a measurement in *Ground Scan* manual measurements can be done with the Trigger. Therefore the button has to be pushed down. If you let it go the button will revert automatically. Alternatively you can connect the joystick with the Socket for joystick to do manual measurements.

With the keys ⬆ and ⬇ you can select every operating mode. To confirm your selection you have to press the button OK.

### 7.1.2 Back View

Figure 31 shows the back view of the measuring instruments and its connections.

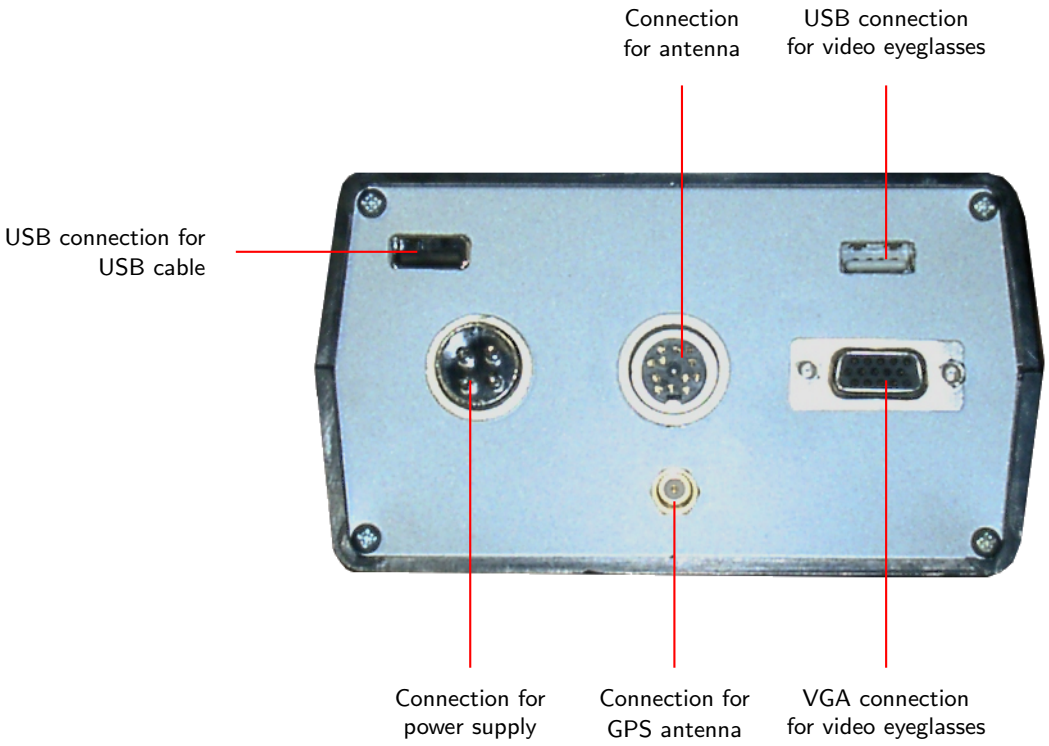



Figure 31: Control Unit, Back View

The connection for power supply is used to connect the battery. Here the external power supply has to be plugged in.

On the connection for antenna different antennas and the DDV system can be connected.

The USB connection for video eyeglasses and the VGA connection for video eyeglasses is used to connect the video eyewear. Via the USB connection for video eyeglasses the video eyewear receive the necessary power supply and transmit the sound.

Via the USB connection for USB cable the device can be connected to a computer via the USB cable. This is necessary if data should be transfered from the device to a computer.

## 7.2 Video eyeglasses

The video eyeglasses are used as the display for this device. All menus and graphical representations are represented via these video eyeglasses. Connect the VGA plug of the video eyeglasses to the Connection of video eyeglasses on the back side of the control unit.


Figure 32: Video Eyeglasses

The audio and sound output is been realized via the Headphones of the video eyewear. The volume can be adjusted via the menu *Settings*.

Via the VGA plug and USB plug the video eyewear are connected with the Control unit.

# 8 Operating Modes

In this section you will learn more about the different operating modes of the device. Every function is been explained in particulary in its proper subsection. The right selection of an operating mode depends primarily of your planned measurement. So for example there are some special functions which have to be used for a first measurement in a unknown area to get a general overview, against which others are more suitable for a detailed search and analysis with a special processing software program.

The device contains the following operating modes:

- **Magnetometer**
  Research of an area with the integrated magnetometer.
- **Ground Scan**
  Measurement with graphical evaluation, whereby measured data can be stored in the internal memory of the device.
- **Metal Detector**
  Activate optional DDV system to discriminate between metals.
- **Discrimination**
  Examination of detected objects regarding to their characteristics on iron contents.
- **Live Scan**
  Measurement with Live representation. No data record is possible in this mode.
- **Settings**
  Setting of date, time and headphones volume.
- **Exit**
  Power off the device and shut down the integrated PC module.

If you are connecting the optional *FS-Thermoscan* to eXp 5000, there will be two more operating modes available. Without *FS-Thermoscan* those functions are inactive and not visible.

- **Thermograph**
  This operating mode is used to view and analyze differences in temperature measured with *FS-Thermoscan*.
- **Thermo Scan**
  In *Thermo Scan* you can create graphical infra red images to visualize the distribution of temperatures of a field.

Both operating modes will be visible in the main menu as soon as the optional device *FS-Thermoscan* is connected to eXp 5000. These options are useful for seeking cavities.

Via a touchpad on the top of your device you can select and confirm your appropriate operating mode.

## 8.1 Magnetometer

You select operating mode *Magnetometer* in the main menu to determine the subsoil taking the earth magnetic field into account. Also you can recognize through the graphical representation of a oscilloscope like picture on the monitor if you are placed above an metallic object.

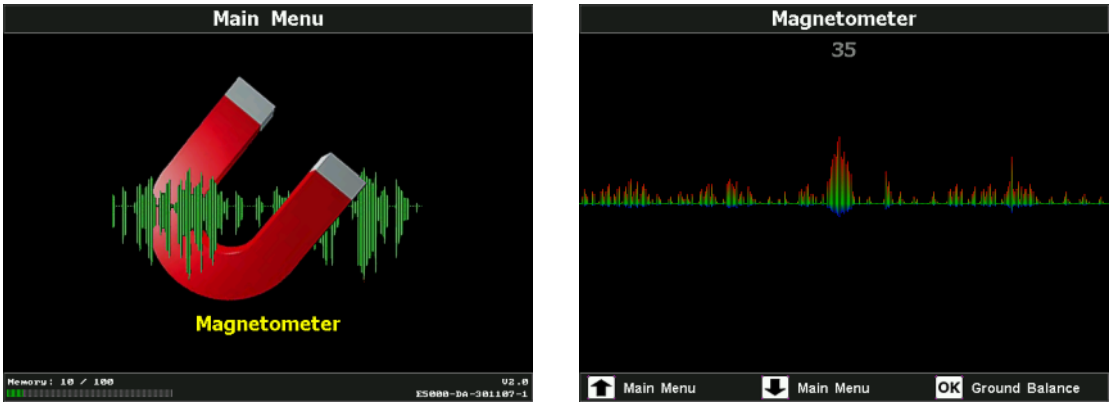



Figure 33: Magnetometer: Main Menu, Representation of Values

This mode can be used with all antennas except the DDV system and livestream sensor. As soon as you confirm the operating mode *Magnetometer* the integrated magnetometer will be adjusted to the current basic ground value of the place where it is situated in this moment. During the initialization process the message *Ground Balance, Please Wait* appears on the display. Only if this message disappears you can start your research.

If you power on the device above neutral ground all metals will be shown with a deflection to the top in your monitor. If the device is situated above a metal while activating the magnetometer, all equivalent metal parts will not be recognized.

By a new press on the button Activate Operating Mode, you can initiate a manual soil reconciliation. Therefore you have to start on a place with neutral ground. With buttons Previous Operating Mode or Next Operating Mode you are leaving the magnetometer mode and turn back to the main menu.

## 8.2 Ground Scan

This operating mode allows you to do a measurement with graphical representation whereby all measured values will be stored in the internal memory of the device. Also you have the possibility to recall and see previous stored graphics or to use the GPS system for navigation to these measurements. This mode can be used with all antennas except the DDV system and livestream sensor.

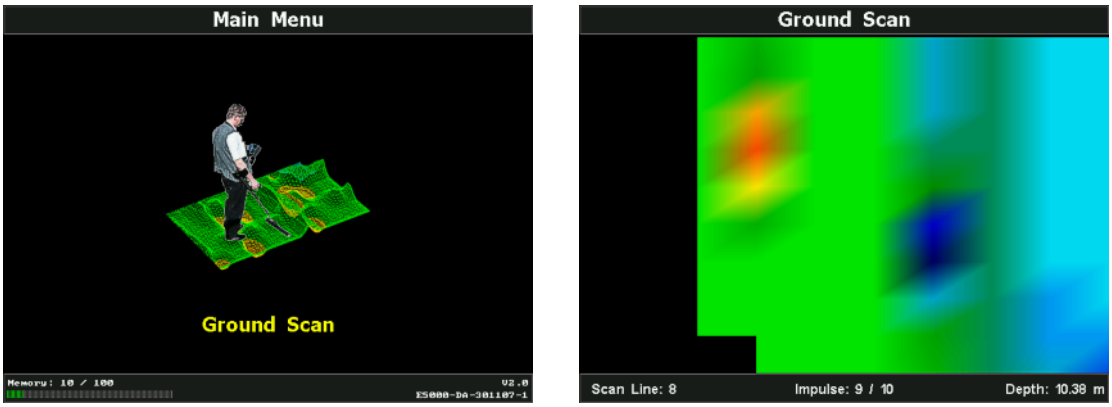



Figure 34: Ground Scan

In the first submenu which is represented in figure 35, you can choose between the following alternatives:

- **New Scan**
  Set up and record a new graphic.
- **Browse Scans**
  See or delete stored graphics. If the measurement has been made while using GPS, you can navigate to the measured area.
- **Back To Main Menu**
  Finish *Ground Scan* and go back to the main menu.

### 8.2.1 New Scan

After activating this operating mode you have the possibility to adjust certain settings. There are different parameters which influence the measurement. In figure 36 you can see the corresponding submenu.

You can modify the following parameters (the underlined values correspond to the setting made by the factory):

- **Impulse Mode** (Automatic, Manual)
  If you are working in mode *Manual* the measured values will only be recorded when using the Emitter of Impulses. If you select mode *Automatic*, the measured values will be recorded and represented continiously .

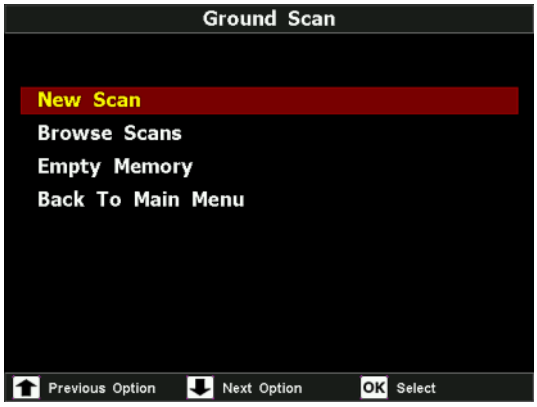



Figure 35: Ground Scan - Submenu

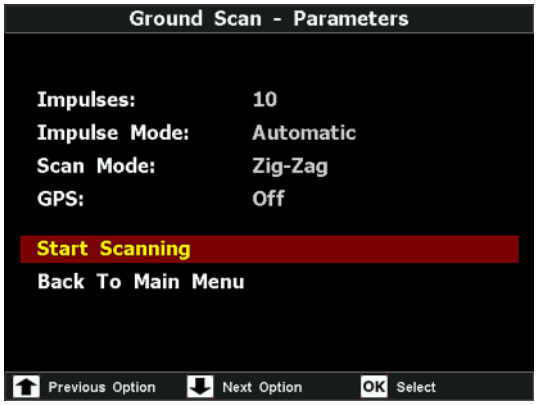



Figure 36: Ground Scan - Parameter

- **Impulses** (10, 20, . . . , 100)
  Number of measured values per search line. How to select the right number of impulses you can read in section 10.3 on page 62!

- **Scan Mode** (Parallel, Zig-Zag)
  Scan Mode defines the method of scanning an area.

  In mode *Parallel* measurement starts always from the starting line, whereas in mode *Zig-Zag* measurement starts at the end of the line which was scanned before, like represented in figure 37. In the last scanning method you have to take care not to change the orientation of the antenna, which means if the white arrow on the side of the probe shows to north direction for example it has to show to north direction in every measured line.

- **GPS** (Off, On)
  If GPS is activated (*On*), the GPS-coordinates (longitude and latitude) will be stored automatically according to every measured value. This data is important if you want to use the GPS navigation.

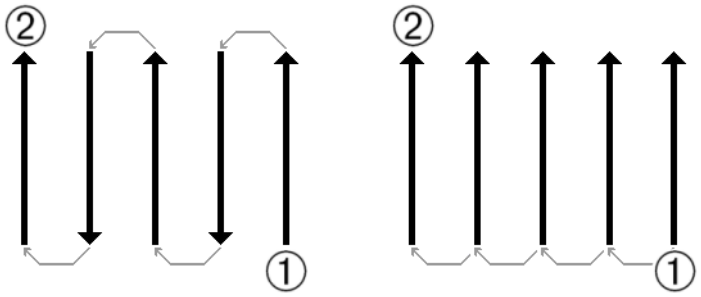



Figure 37: Zig-Zag or Parallel

Select the parameter, which you want to change with the keys Previous Operating Mode and Next Operating Mode, until it is highlighted in red color. Now press the key Activate Operating Mode. The marking will change, so that only the current value is highlighted in red color. Now you can change the value of the selected parameter by using the keys Previous Operating Mode and Next Operating Mode. To finish this process you have to press again the key Activate Operating Mode.

Go to your start position and adjust all necessary parameters to your needs. Then you have to select option *Start Scanning*, to start the measurement. The message from figure 38 will appear and ask you if you want to start your first measure line now.


Figure 38: Start first scan line?

While using the keys Previous Operating Mode and Next Operating Mode select option *Yes*, if you want to start the measurement. Confirm your selection by pressing the key Activate Operating Mode. While the device is now sending out the impulses regularly you have to walk continiously your first measured line. As soon as your first scan line is finished a new message will appear, where you have to select *Yes* if you want to scan another measured line.

Repeat this procedure until you scanned your complete area. Step by step a graphical representation similiar to figure 39 will built up.

The graphic should represent green color values in majority, which represent normal ground. In this green area red and blue objects can be placed. Metallic objects are normally represented

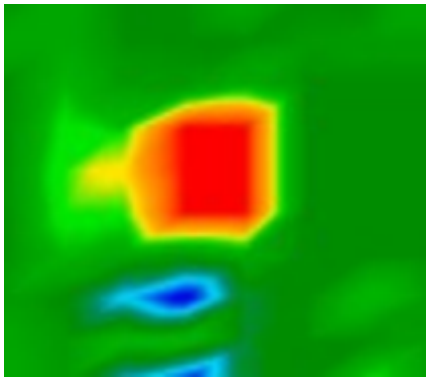


Figure 39: Graphical Representation of a Measurement in Operating Mode Ground Scan

in red and cavities, water reserves and earth interferences in blue color. Beware that mineralisations of the ground are also shown in red color. How you can differentiate minerals and mineralisations from „*real*“ metals, you can read in section 10.1 on page 59 or in the manual of your software program.

*It is absolutely necessary to read section 10.2 on page 61, where the principle procedure of a graphical measurement is described.*

### 8.2.2 Browse Scans

After confirm menu option *Browse Scans* with the key Activate Operating Mode you will see a list of all stored measurements, like represented in figure 40.

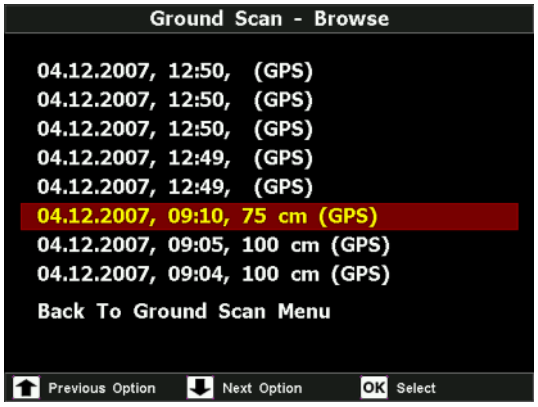



Figure 40: Select Stored Measurement

Select the measurement which you like to see with the keys Previous Operating Mode and Next Operating Mode. Every measurement with GPS data is indicated with the additional lettering *GPS*. Only these measurements are convenient for the GPS navigation.

For the selected measurement the following options represented in figure 41 are provided.

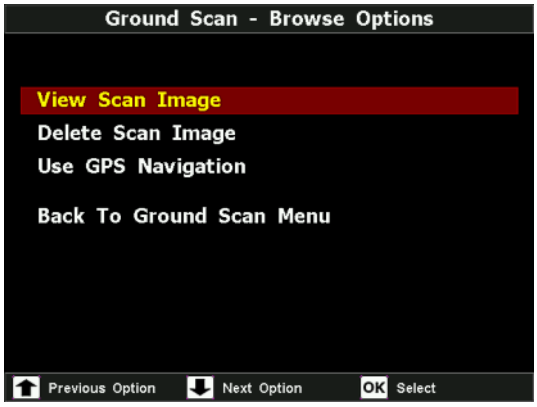



Figure 41: Submenu: Browse Scans

- **View Scan Image**
  The selected measurement will be displayed once again. Press any key to go back to the selection menu.
- **Delete Scan Image**
  The current selected measurement will be deleted, if you confirm the following message with *Yes*. Following you will go back to the menu *Ground Scan*.
- **Use GPS Navigation**
  Start the navigation to the stored GPS data from this measurement. After you confirmed the this option, you will see a representation like in figure 42. If the GPS Receiver have no or insufficient data the message *Searching for Satellites* will appear and the programm is waiting until sufficient data is available.

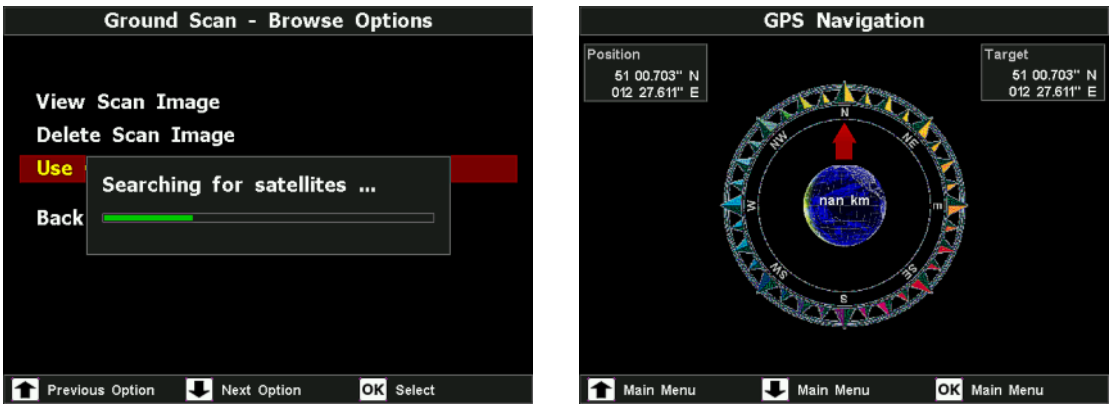



Figure 42: GPS Navigation

If sufficient satellites and their data are available the navigation will start. The arrow indicates you in which direction you have to walk to reach the selected measured field. In the upper left corner you can see your current position and behind in parenthesis the destination point is displayed. On the lower left side you can read the distance to your destination point. This indication is only correct if sufficient satellites are available and

you do move forward. Only by moving and with the corresponding data the direction and distance of your destination can be determined. You can press any key to come back to the selection menu.

- **Back To Ground Scan Menu**
  You go back to menu *Ground Scan*.

## 8.3 Metal Detector

To use this operating mode you have to connect the optional DDV system at first. The detector is specialized to find small objects (e.g. coins) which are located near to the surface.

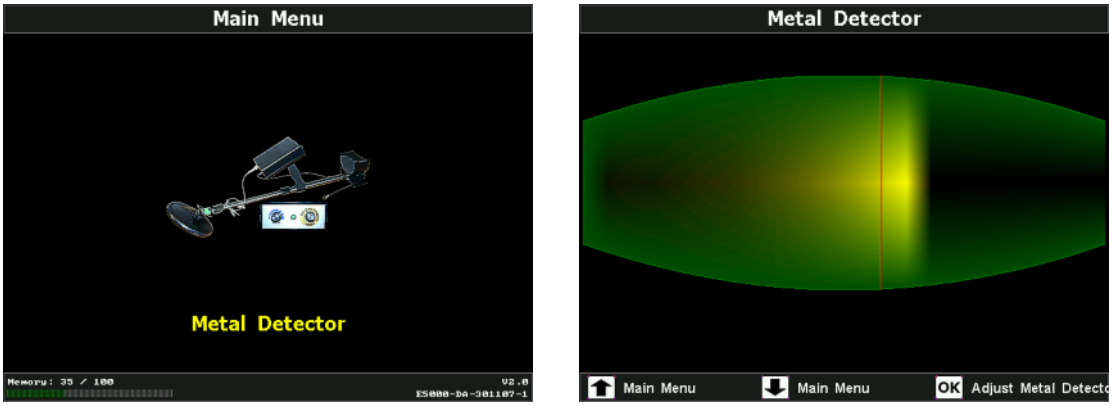



Figure 43: Metal Detector

Also with the detector you have the possibility to determine the material of possible objects. So for example you can find out if an object consists of gold, silver or iron.

Further information about the correct usage of the detector and the principle of discrimination you can find in section 9.1 on page 48 of this users manual!

## 8.4 Discrimination

This operating mode is used to identify metals and cavities. Therefore it is necessary to connect the optional available super sensor or the antenna for tunnel detection. There is no given manner fixed or a scan direction. You can walk as you want to determine the soil. This operating mode is most effective if you already detected possible objects and now want to know more details about them.

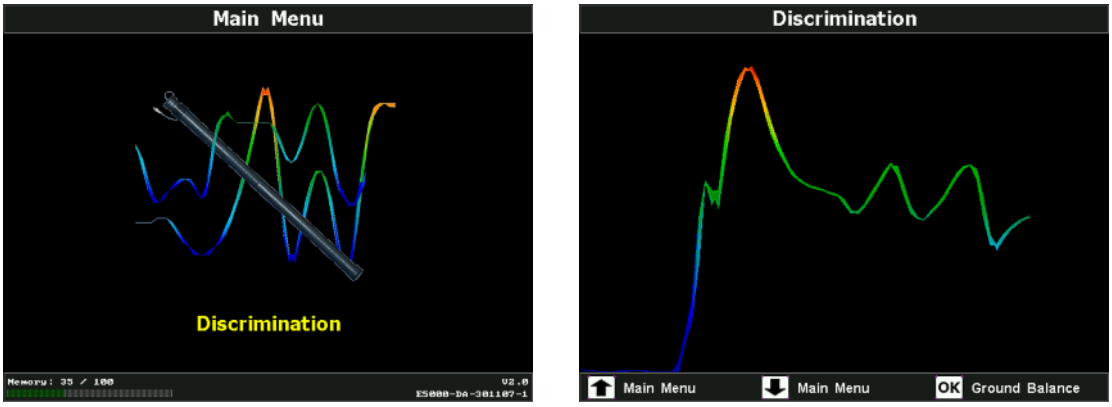



Figure 44: Discrimination

During the measurement you will get a live picture on the screen of your device. The different curves give conclusion to the characteristics of possible objects.

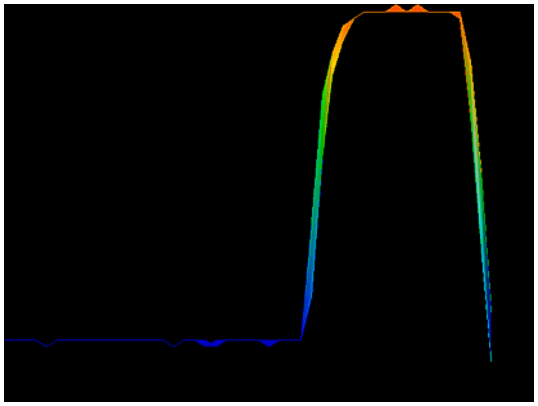


Figure 45: Curve Shape of Iron

Figure 45 shows which principle curve shape is created if you pass above an iron object. Typically is the high deflection to the top followed by the same deflection down.

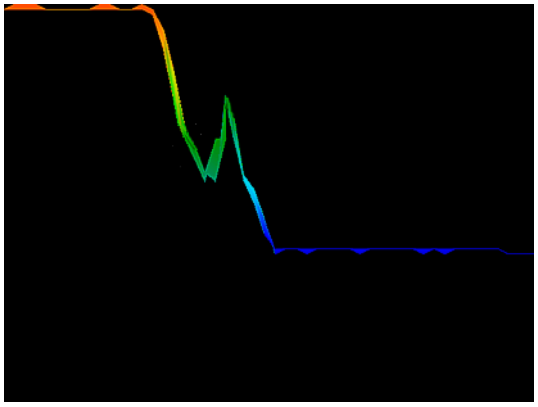


Figure 46: Curve Shape of Precious Metals

Figure 46 shows which principle curve shape is created if you pass above a precious metal. Typically is the small additional deflection with the difference that there is no deflection down.

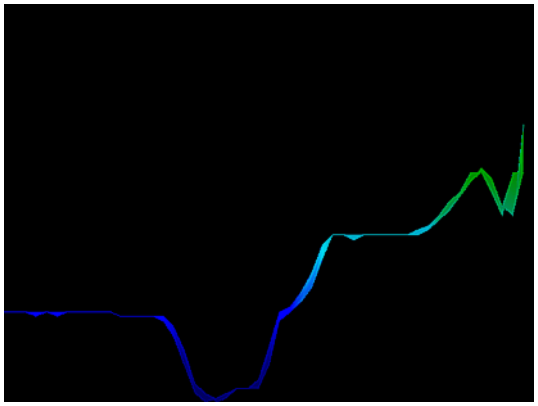


Figure 47: Curve Shape of Cavities

Figure 47 shows the principle curve shape when passing over a cavity. Typically is the high deflection down. But there is no equivalent deflection in the opposite direction.

## 8.5 Live Scan

To work in the operating mode *Live Scan* you have to connect the LiveStream-Sensor to your device. This probe is marked with a white arrow which is fixed on the upper side of the probe. During a measurement this white arrow should always be directed to the left side. Also you should take care that the arrow which is situated on the strait side of the probe is always directed to the ground. Be sure that the probe is correctly aligned before activating this operating mode.

Figure 48: Live Scan: Orientation of the LiveStream-Sensor

In this operating mode you do not have to keep a defined scan direction. You can walk forwards or backwards over your measured area. On the screen you will see immediately what is currently situated right under the probe. The graphical representation is similar to operating mode *Ground Scan*.

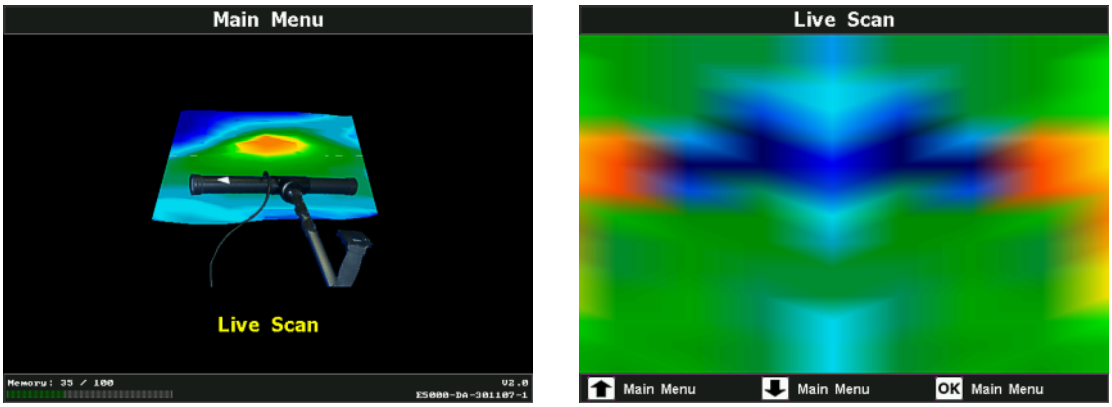



Figure 49: Live Scan: Main Menu, Representation of Measured Values

All measured data will *flow* over the screen. Also when you are not moving, the measured values were updated constantly. If you are situated right over a target it will be visible on the screen, also if you are not moving.

*The measured values in operating mode* Live Scan *cannot be stored.*

## 8.6 Settings

In this operating mode you have the possibility to set the date and time. The correct adjustment of date and time are very important, because both settings are stored together with the graphical measurement in menu *Ground Scan*. This allows you to identify each measurement according to date and time.

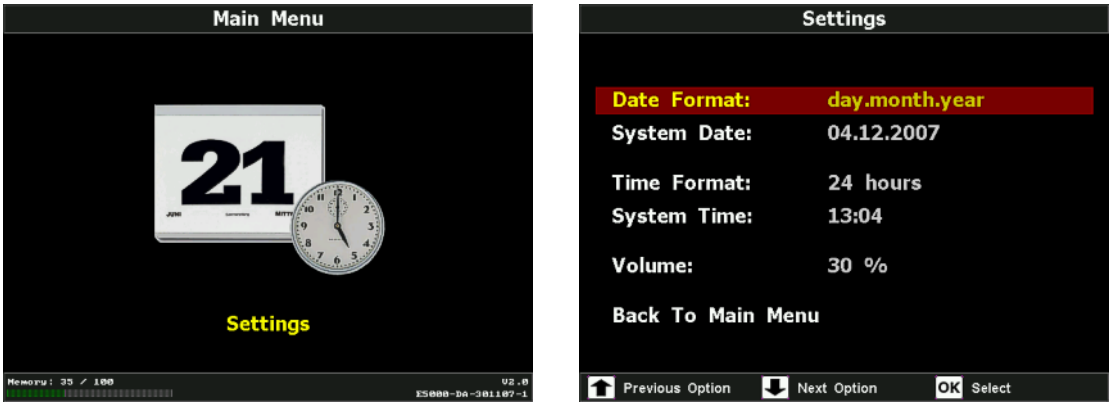



Figure 50: Settings

You can select between the following possibilities:

- **Date Format**
  Setting of date format (day.month.year, day/month/year, day/month/year).
- **System Date**
  Setting of date.
- **Time Format**
  Setting of time format (24 Hours, 12 Hours + am/pm).
- **System Time**
  Setting of time. Preset is Central European Time (CET).
- **Volume**
  Setting of headphones volume.
- **Back To Main Menu**
  Leave *Settings* and go back to Main Menu.

Select the parameter, which you want to change with the keys Previous Operating Mode and Next Operating Mode, until it is highlighted in red color. Now press the key Activate Operating Mode. The marking will change, so that only the current value is highlighted in red color. Now you can change the value of the selected parameter by using the keys Previous Operating Mode and Next Operating Mode. To finish this process you have to press again the key Activate Operating Mode.

## 8.7 Exit

You have to select option *Exit*, to finish the operation with this device. As soon as you confirmed this selection the integrated pc module will shut down and the device will power off itself.

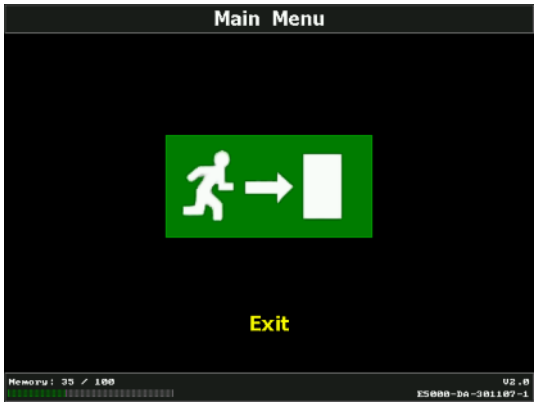



Figure 51: Exit

*Please wait until the device has powered off itself. After the device is switched off you can power off the external power supply.*

## 8.8 Thermograph

This operating mode is only visible and usable if the optional device *FS-Thermoscan* is connected. Detailed information about this functionality is available in the user's manual of *FS-Thermoscan*!

## 8.9 Thermo Scan

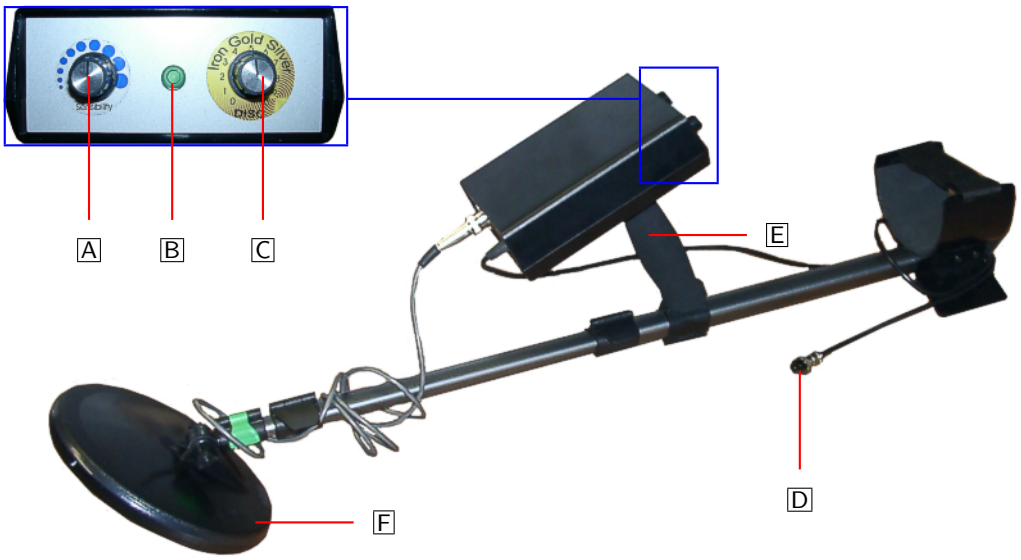
This operating mode is only visible and usable if the optional device *FS-Thermoscan* is connected. Detailed information about this functionality is available in the user's manual of *FS-Thermoscan*!

# 9 Optional Equipment

Here you can find additional information about all equipments which are available as optional accessories to the basic package. Keep in mind that the mentioned parts and devices in this section must not belong to your scope of delivery.

## 9.1 DDV System

With the *DDV System* (Disc Detector Visualization System) a powerful metal detector is on your disposal, which not only supports your underground research with a visual representation but also offers you various filter possibilities.




A Sensibility Regulator
B Operating Lamp
C Discriminator
D Connector
E Retaining Handle
F Coil

Figure 52: Control Elements of the Detector

To use the DDV System just plug in the connector D into the Connection for Probe of the control unit. Then select the operating mode *Metal Detector* in the main menu.

**Attention:** As soon as you confirm this option the ground balance will start. Detailed information you can find in section 9.1.3 on page 51!

Now you have to pivot the detector coil continiously right above the ground, trying to keep the same distance to the soil. Adopt the rhythm of the graphical representation on the screen. As soon as you pass above a metallic object a yellow colored trace will appear in your graphic and you can hear an acoustical sound through the headphones.

### 9.1.1 Calibration

*The manual calibration is only possible for product version V1.1. and following. In case of need all former product versions have to be calibrated from the manufacturer. The version of your device you can read inside the main menu.*

Before using the metal detector for the first time the DDV system has to be adjusted on the eXp 5000 . If you purchased the DDV system together with the main unit the metal detector has already been calibrated in the optimal way. Anyway you have the possibility at any time to recalibrate the DDV system. Therefore you have to activate at first the operating mode *Metal Detector*.

Place the DDV system on the ground like shown in figure 53. Take care that no metal is situated near to the coil probe [F]! Press the key *OK*, to start the calibration.

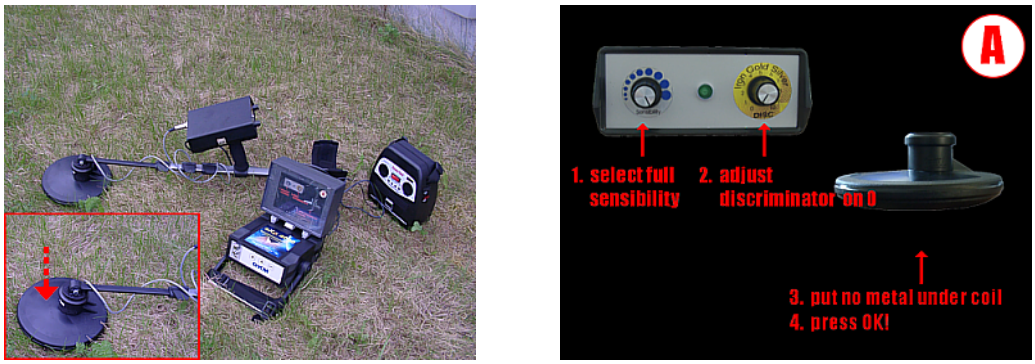



Figure 53: Calibration of the DDV system, step 1

In the first step of calibration you haveto turn the regulator of sensibility [A] completely to the right side and so adjust it on full power. The discriminator [C] has to be adjusted on the value 0. Take care that no metal is located near to the coil probe [F]! Now press the key *OK*, to start the calibration. Wait until this process is finished.

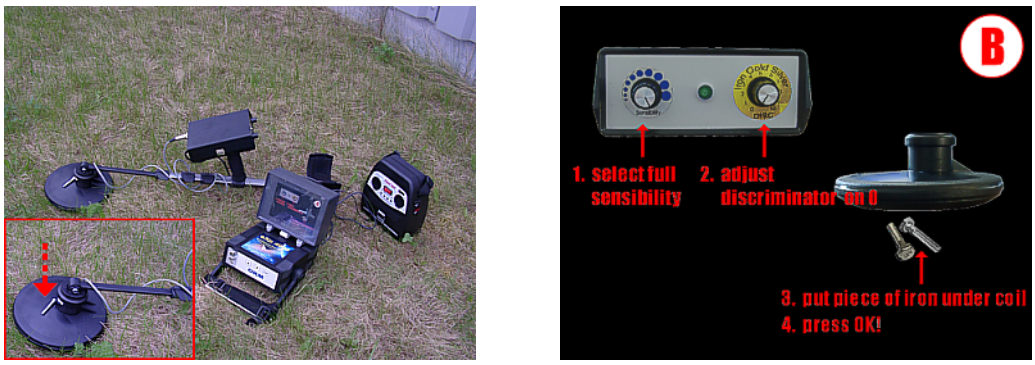



Figure 54: Calibration of the DDV system, step 2

In the second step of calibration you have to leave the regulator in the same position and place a piece of iron (e.g. screw or nail) under the detector coil. Alternative choice is to place the

metal directly on the top of the coil probe, like you can see in figure 54. Now press again the key *OK* and wait until this process is also finished.

After finishing the calibration a visual signal (yellow light) should be visible on the screen. If the headphones are connected you will also hear an acoustical signal. The DDV system is now calibrated to work correctly on-site.

### 9.1.2 Adjust the Discriminator

The discriminator serves to filter certain materials. So it is possible to „*exclude*“ for example worthless iron and steel objects. Or people who are hunting for treasures and gold are able to exclude other materials with the help of this discriminator.


Figure 55: Adjustment of discrimination

In figure 55 the regulator to adjust the discrimination is represented. This regulator can filter certain materials. Table 5 explains the adjustment in the case of normal ground conditions[1].

| Adjustment | Indicated materials |
|---|---|
| **0** | All metallic objects |
| **3** | Iron, gold, bronze, silver, aluminium |
| **5** | Gold, bronze, silver, aluminium |
| **7** | Silver, aluminium |
| **10** | Aluminium |

Table 5: Standard adjustment of the discrimination

When you adjust the regulator for discrimination on gold, the detector reacts besides gold also on bronze, silver and aluminium. To find out if there is really gold in the ground you have to follow the following instructions:

1. Switch the discriminator on gold and start your soil examinations until you reach a place where the detector reacts positive, which means you can hear an accustical sound signal.
2. Now switch the discriminator on silver and examine this place again. Following there will be two possibilities:

[1]The indications from table5 concern the use in normal type of soil. In extreme conditions (mineralisation, salt deposits, ...) they can variate from this normal value.

- the detector reacts positive → the material under the ground is *not* gold, but could be silver or aluminium.
- the detector does not react → there is probably golden material in the ground but also bronze is possible.

Please consider that you always should do the ground balance, which is explained in this following section.

### 9.1.3 Ground Balance

A correct soil reconcilation is absolutely necessary that the adjusted discrimination can work properly. If the soil reconciliation is not done correctly the operation of the device and the integrated discriminator cannot work properly.

In the following section you can find a list of all necessary working procedures to do a correct soil reconciliation:

1. Power on the eXp 5000 and connect the DDV System.
2. Adjust the discriminator [C] on the material you like, see previous section.
3. Put the device with coil [F] approx. 10 cm above the ground.
4. Select the operating mode *Metal Detector* and confirm it.

If you hear an acoustic signal from the DDV System after these indications, then the ground balance is not finished correctly. Repeat these steps until there is no acoustic signal from the metal detector.

The following causes can prevent a correct soil reconciliation:

- You are staying above a metalic object.
- You confirm the operating mode *Metal Detector* without holding the coil [F] directly above the ground.
- During the confirmation of the operating mode *Metal Detector* you are holding the coil [F] to high and then minimize the distance to the ground.
- You are turning the discriminator [C] during ground balance.

*Only if you are doing a correct soil reconciliation the functionality of discrimination can be guaranteed!*

## 9.2 Super Sensor

The Super Sensor is a hig hresolution antenna, which is specially adjusted to detect metals. Yet it is also possible to recognize larger voids with this antenna. A particular characteristic is to distinguish ferrous metals from nonferrous metals. This discrimination is possible in the operating mode *Discrimination* (Section 8.4 on page 42). Compared to the standard Horizontal GPR-antennas the Super Sensor can find much smaller and deeper situated metal objects. The maximum penetration depth is 25 m[2].

### 9.2.1 Usage

The Super Sensor can be used in the following operating modes:

- Magnetometer (section 8.1 on page 34)
- Ground Scan (section 8.2 on page 35)
- Discrimination (section 8.4 on page 42)

To use the Super Sensor with the eXp 5000 , you just have to connect it to the main unit. Therefore you have to plug in the connector of the antenna in the appropriate input of the device. Hold the antenna always vertical to the ground in your hand, whereby the cable should come out at the upper end of the antenna. The figure 56 shows how the Super Sensor has to be hold in a correct way.

Figure 56: Position of Super Sensor

The Super Sensor should not be swinged nor moved up and down during the measurement. The more even you hold the antenna the better will be your measured graphical results. The distance between the ground and lower part of the antenna should be about 10 cm, but can be enlarged depending on the terrain conditions.

*The orientation of the antenna should not be changed during the complete measurement!*

[2]depends on object size and ground conditions

## 9.3 Very Low Frequency Emitter (VLF)

With the *VLF* an emitter is available which can optimize your search for metallic objects.

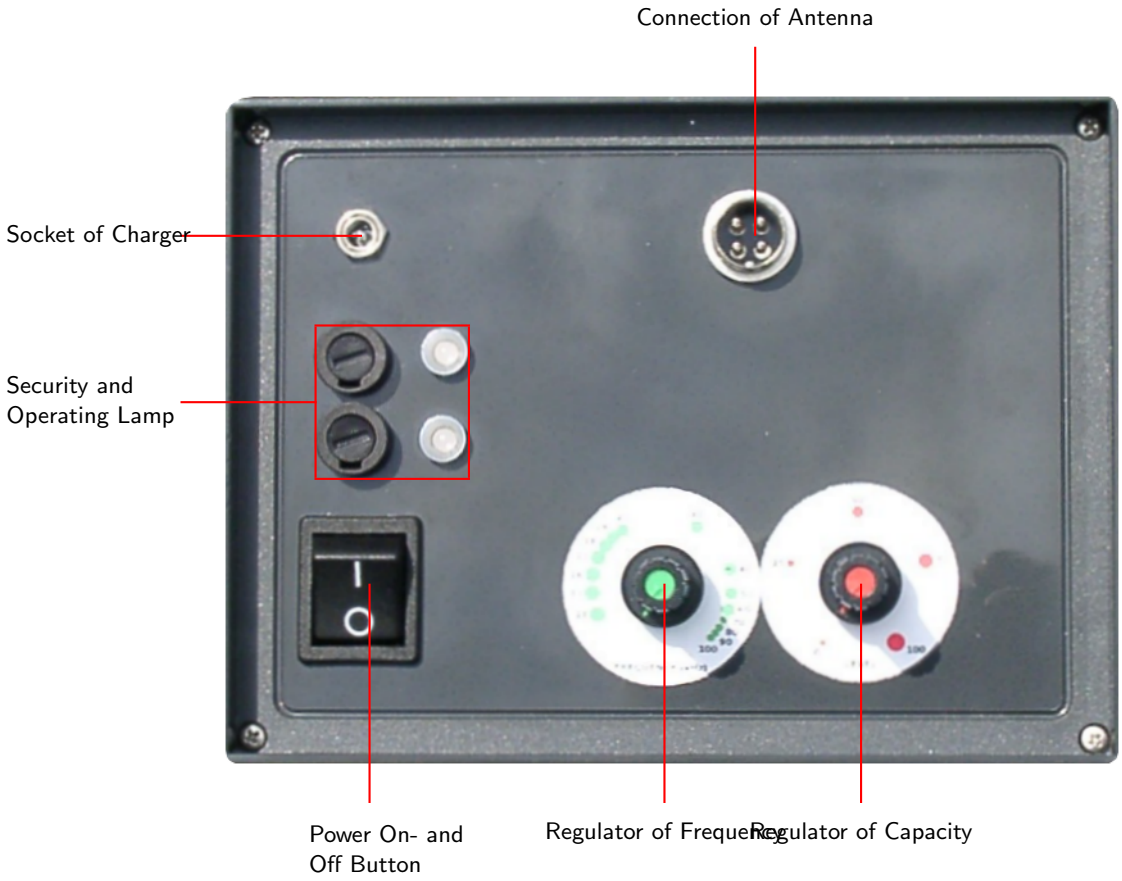



Figure 57: Control elements of the VLF emitter

With the Power On- and Off Button the device can be switched on and off.

In the Socket of Charger the charger has to be connected to reload the internal batteries. The state of the batteries can be surveilled and controlled with the Operating Lamps. If the batteries are charged fully the operating lamps will shine green. With decreasing of the voltage the lamps will change the color themselves from yellow to orange up to red.

The Regulator of Frequency is used to adjust the sending frequency.

The Regulator of Capacity the sending capacity can be adjusted.

In the Connection of Antenna the delivered antenna has to be connected.

### 9.3.1 Assembly

This section describes how to assemble the emitter and prepare for a measurement.

Figure 58: Connection of emitter antenna

In figure 58 you can see how to connect the emitter antenna. The antenna is fixed up with the velcro fastener on the outside of the VLF emitter. Remove it and put in on the ground in a distance of about 50 cm from the emitter.

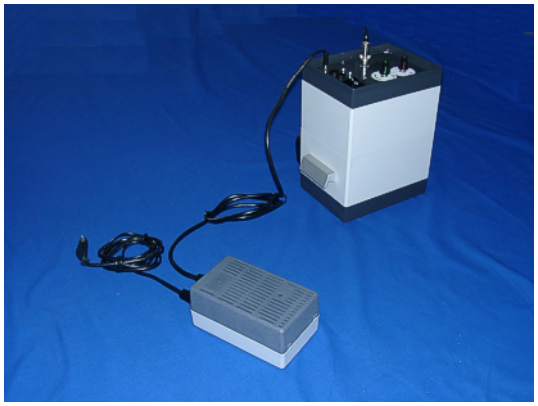


Figure 59: Connection of the Charger

If the batteries are empty you have to reload them. Figure 59 represents how to connect the charger.

### 9.3.2 Usage of the VLF Sender

After you have attached the antenna and loaded the batteries completely you can operate the VLF emitter.

*Beware that the* Regulator of Capacity *(LEVEL) is switched on 0 before power on the emitter and the antenna is put on the ground in a distance of about 50 cm from the emitter.*

After powered on the device both Operating lamps has to shine green, otherwise you should reload the batteries again.

Now adjust the desired frequency and capacity before scanning your area! With the Regulator of Frequency you can select the desired emitter frequency. Normally frequencies of less than 40 kHz are used. The Regulator of Capacity is prosecuted generally between 50 and 100.

Figure 60: Placement of the VLF emitter on a site

Place the four VLF emitter in a square or rectangle and power on all sender. Now you can execute a normal measurement in operating mode *Ground Scan*, see figure 60. By using the VLF emitter in particular all metallic objects will be enforced more than a measurement without emitter. Important is the correct adjustment of the parameters of frequency and capacity. An exact specification is not possible because it is strongly depending on the particular ground circumstances.

### 9.3.3 Safety Guidelines

It is absolutely necessary to beware the following safety guidelines, to guarantee a secure work with the VLF emitter.

- Do not hold any receiver, like metal detectors, probes or others directly over the emitter antenna during the operation of the VLF emitter. The enforced field of the antenna can destroy their electronics.
- Keep a distance of at least 50 cm between antenna and VLF emitter. Avoid close contact to the emitter antenna during operation.

- If a change of electrical fuse should be necessary, only fuses which are structurally identical may be used, which value agrees with those on the equipment.
- Power off the device before loading the internal batteries.
- For charging use only the provided battery charger.
- Power off the device if it is not any longer used otherwise the batteries can be damaged.

## 9.4 Visualizer 3D

*Visualizer 3D* is a software program which is used to analyze the scanned images in a more professional way. This visualization software allows a complete evaluation of the measured results in your computer.

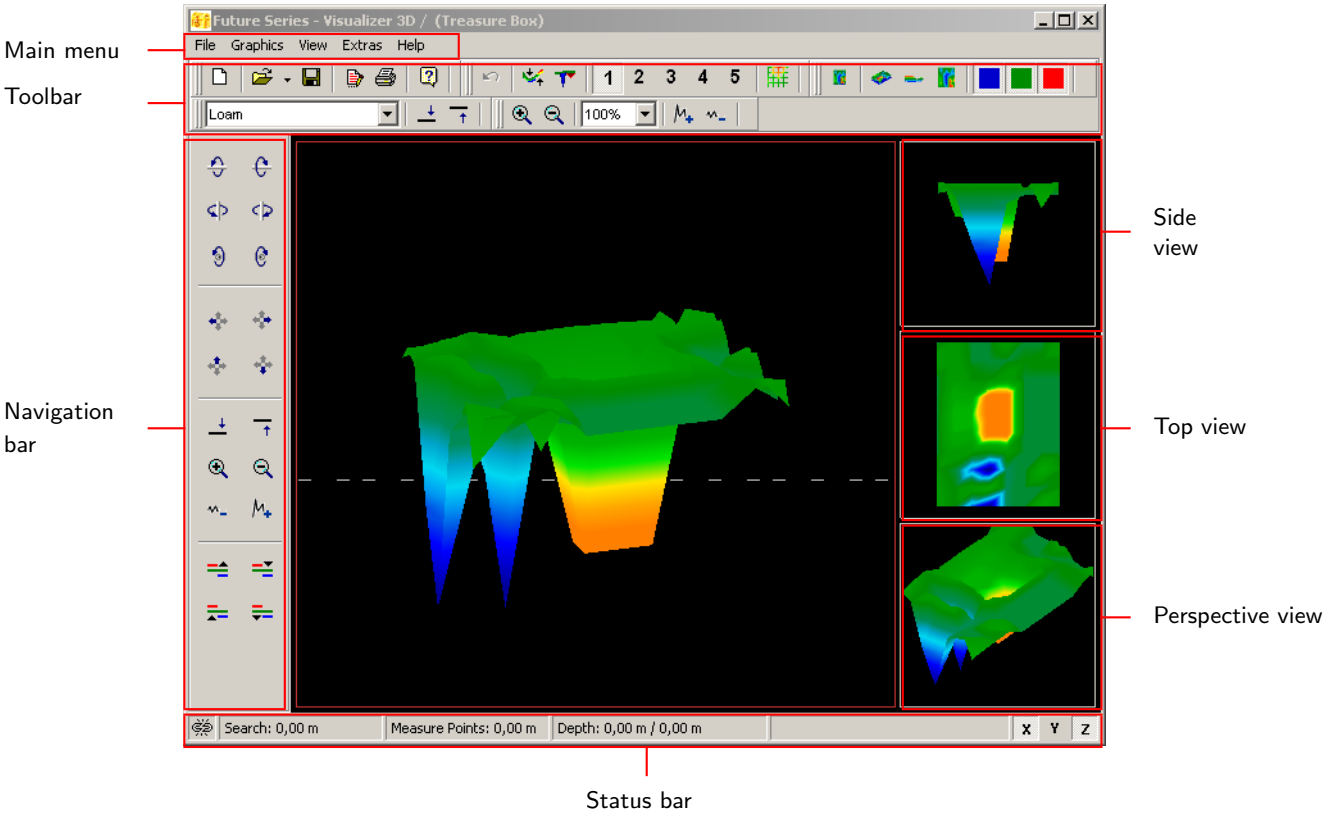



Figure 61: Software

Visualizer 3D software has the following functionality:

- **Depth measurement**
  Due to the selection of the special type of soil in your measured area the depth of an object can be determined exactly.
- **Signal correction**
  Possible error signals inside your measurement can be filtered out automatically or manually.
- **Grid pattern**
  For exact determination of the position of targets or voids the graphic can be represented in a grid pattern view, which makes visible every single measure point and every scan line.
- **Representation**

The representation is a 3d graphic in real dimensions, which allows a better visualisation of a measured area.

Detailed information about this software program you can find the appropriate user's manual of this software.

# 10 Analysis and Evaluation of Measurements

Before measurement you have to know what kind of objects or cavities you are looking for and if the area you choose is suitable for this. Measurement without a plan will not give you the results you would like. For this reason please consider the following indications:

- What are you looking for (graves, tunnels, buried objects, ...)? This question has its effects on your concrete manner to measure an area. If you are looking for big objects you can enlarge your distance between the measure points (impulses), for small objects use small distances (see section 10.3 on page 62).
- Inform yourself about the area you select for measurement. Is it usefull to search at this place? Are there historical indications, which confirm your speculations? What type of soil is on this area? Are there good conditions for data recording?
- Your first measurement in a unknown area has to be large enough to get representative values (f. ex. 20 impulses, 20 search lines).
- 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 exact values concerning the depth measurement, the object has to be in the centre 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 a correct depth measurement is not possible.
- There should not be more than one object in a graphic. This will influence the exactness of depth measurement.
- You should do at least two control scans to get sure about your results. So you also can recognize and isolate mineralized ground (see section 10.1 on page 59).

## 10.1 Metal or Mineralisation

At the beginning it is not always easy to make a difference between real objects and mineralized ground. In principle metals are represented in red color, but mineralized accumulations can also include red signals.

Here some advice how you can differentiate between a real object and a mineralisation:

- **Form**
  If the object represented in your graphic has a special form (f. ex. rectangle, circle, ...), you can conclude of a possible real found.
- **Color**
  If there are many yellow and orange color values around the object, it will be probably a mineralisation.
- **Depth**
  With a small depth of about 0,10m or 0,40m there is a high possibility that there is only a mineralisation of the ground.

- **Color Filter**
  If position and form of the object are changing with the use of the color filter it is probably a mineralisation.

- **Control Scan**
  If position, depth and form of the object stay nearly the same, also in further control scans you can conclude of a real object. Also if some graphics look similiar you always have to compare all indications.

Figure 62 shows a real object (left side) and a mineralized accumulation (right).

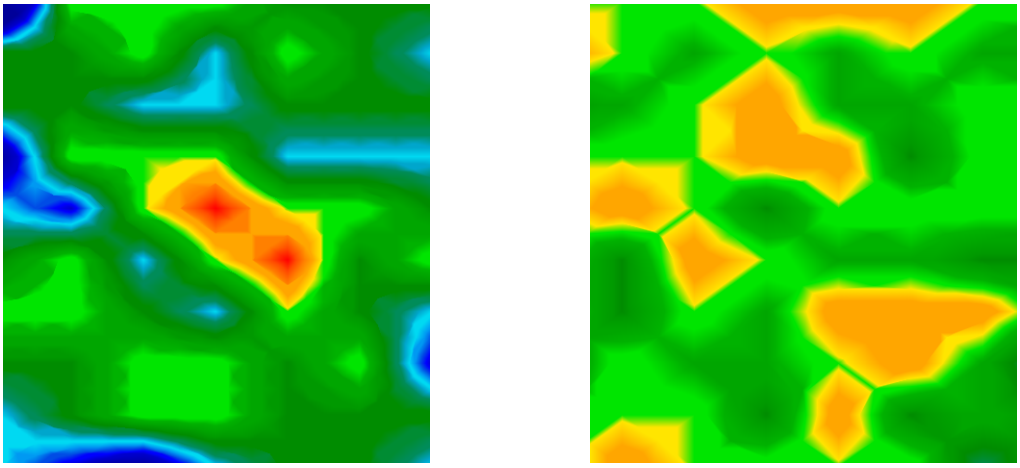


Figure 62: Comparison of object and mineral

## 10.2 General Procedure

The main rule for scanning an area is:

**The more exactly you scan an area**
**the better will be your graphical evaluation.**

You have to scan in a given manner that the software can calculate the measured values in the right way. Your device has following possibilities:

- **Zig-Zag**
- **Parallel**

Figure 63 shows all different ways of scanning in a scheme. The measurement starts at your starting point ① and ends at point ②.

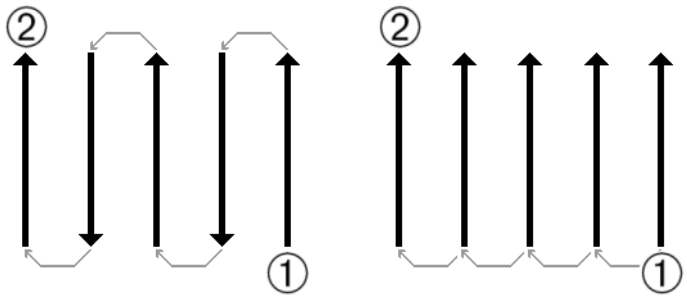



Figure 63: Given manner

If you have finished one scan line, the next line has to be on the *left* side. Do not change the direction of your probe.

The more you repeat your scanning above a possible object (control scans), the better you can decide afterwards if it is a real object or not. Temperature, other radio transmission, sun energy, mineralisation of the ground, loam, salt, water, etc. can influence negatively the measure results.

Before you start to dig, take your time to do some control scans. Repeat exactly the same scan about 3 - 5 times, to be sure about your results. Only if all these graphics have almost the same values you can be sure about your results.

Figure 64 is a graphical representation of a measured area. The blue rectangle marks a possible object in the ground.

To be absolutely sure that there is an object in the ground you have to do a control scan. Measure exactly the same area, same starting point and the same number of impulses and lines. Take also the same distance between the measure points. Figure 65 and 66 shows two possible measurements.

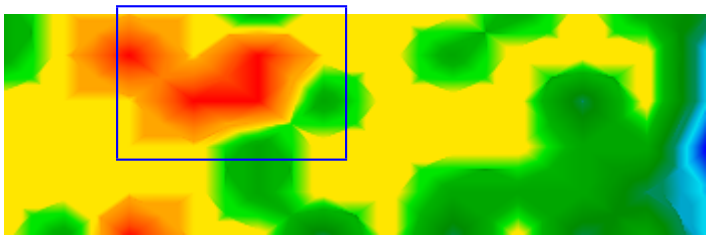


Figure 64: First measurement of an area

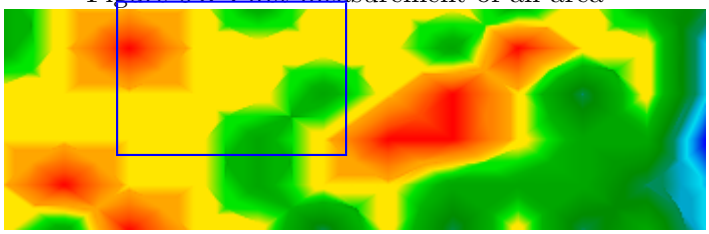


Figure 65: Control scan, Variant A

It is easy to recognize that the control scan in figure 65 is totally different from the first measurement in figure 64. This means only a mineralisation of the ground, not a concrete metalic object.

Even if the control scan in figure 66 is not exactly the same to the first one, you can see that the blue marked parts show nearly the same values. This is a reference for the existence of an object.

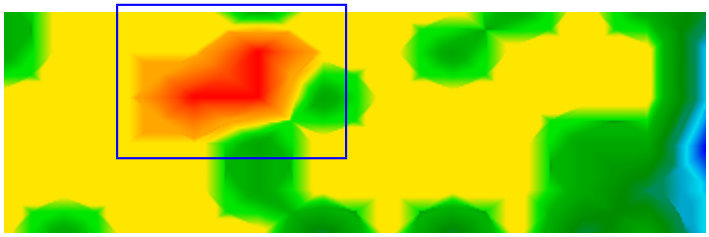


Figure 66: Control scan, Variant B

Before you can determine the depth of the detected object you have to scan a further image. It only should cover the blue marked area. All other metals and mineralized ground should be ignored because it would disturb the measurement. After this you can determine the correct depth.

## 10.3 Regulation of the Number of Impulses

There is no special rule for the number of impulses. But there are different aspects which has to be considered. These are for example

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

The optimal distance between two impulses is about 20cm until 30cm. The smaller the distance between two impulses is the more exactly will be the graphical representation. If you are looking for small objects you have to select a small distance, for big objects you can increase the distance between each impulse.

Figure 67 shows the effects of the distance and the number of impulses per scan line for some objects.

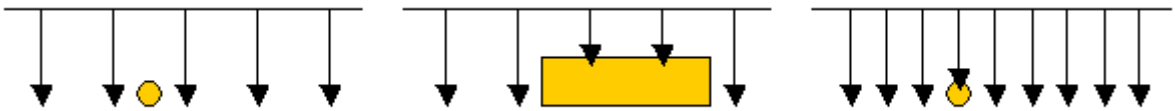


Figure 67: Effect of number of impulses and their distance

Figure 68 shows the difference between very few impulses (left side) and much more impulses on the same scan line length (right side). The second record (right side) shows much more details and also smaller objects can be seen.

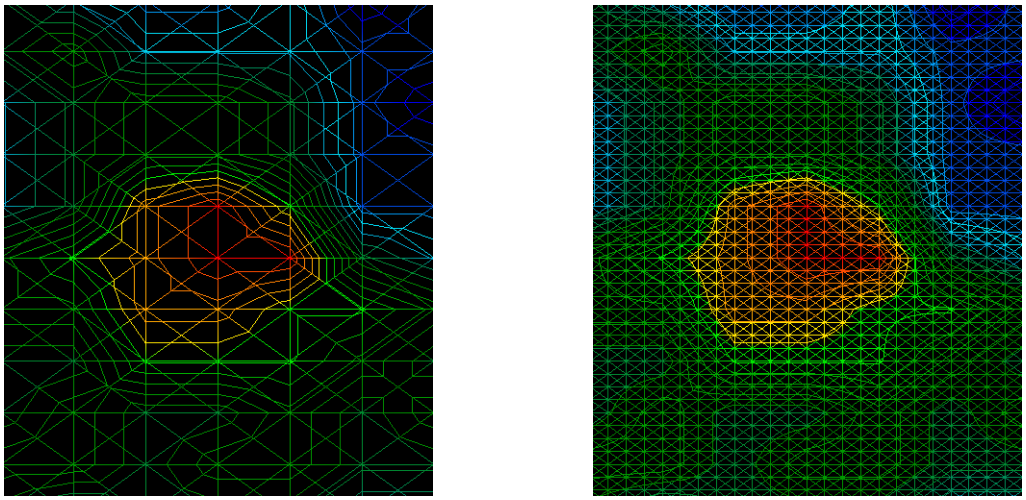


Figure 68: Comparison of small and high number of impulses

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 for the search of bigger objects you can proceed like this. With this manner you can measure relatively fast a large area and afterwards you can record the interesting subsection.

Further information about the graphical analysis you can find in the appropriate software manual.

# 11 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 colour 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 or children.

# 12 Error Messages

In this section you can find possible error messages which can appear during the work with the device.

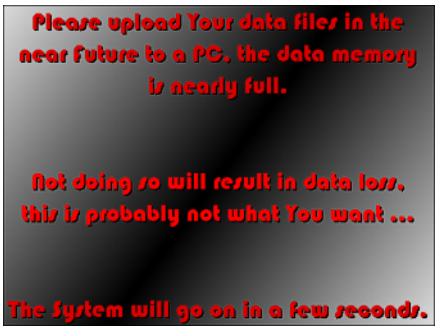



Figure 69: Only a small amount of memory available

Because every scan in the operating mode *Ground Scan* will be stored in the internal memory of course the memory place will decrease over time. As soon as the free memory cell is less than 20% the following message like in figure 69 will appear.

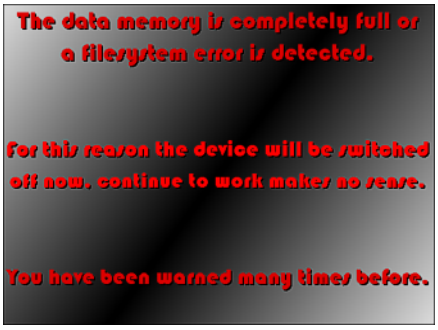



Figure 70: No free memory available

If there is no more free memory available you will see a message like in figure 70. You can create more memory space if you transfer all stored data with optional software to your computer or if you select option *Empty Memory* to delete all stored data without having transferred them to your computer.

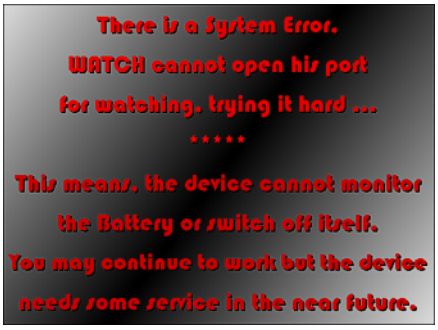



Figure 71: Internal Hardware Error

If message 71 appears the device cannot control the operating voltage. This also means it cannot warn you in case of a low status of the battery. Also the automatic shutdown of the device may be affected. It is adviced to let the device check from the manufacturer to avoid further damages. Ask your dealer for further help.


Figure 72: The external power supply has to be charged

Message 72 appears if the battery is low because of a long operating time with the device and not enough voltage is available. You should power off the device and charge the external power supply as soon as possible. If you continue operating with the device it could be possible that data can get lost.

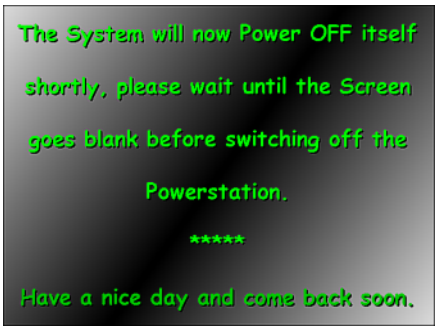



Figure 73: Shutting down the system

Because there is a PC module integrated in the device you have to shutdown it like a normal

computer. Therefore you have to use option *Exit* from the main menu. The following message like in figure 73 remind you to wait until the device powered off by itself.


Figure 74: Shutting down the system is not possible

If the device itself is not able to power off, a message like in figure 74 is shown. In this case you simply power off your external power supply.

# 13 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

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

Beware that all batteries and accumulators are always charged fully while operating with your system. Please recharge your batteries after each usage completely! In this way a long durability of the used batteries is guaranteed.

*To load the external and internal batteries you have to use only chargers which are part of our scope of delivery.*

# Index