CE

Ground Penetrating Analyzer Duo XL

GPA Duo XL

User's Manual KTS – 3 D

KTS-Electronic

Germany

Table of content

1 General guidelines

1.1 Preface

Congratulations on your purchase of one of the most advanced geophysical ground control equipments – GROUND PENETRATING ANALYZER DUO XL.

Since programs are already installed, the instruction manual is written in plain style and provided with numerous illustrations the assembly is easy and uncomplicated so that nothing stands in the way for a practical application. This instruction has been developed by the KTS-Electronic company. Any alterations or duplications are only allowed with written permission of KTS-Electronic. KTS-Electronic reserves the right to modify the instruction with new knowledge at anytime. The new instructions can be downloaded gratuitously from our website.

1.2 Important information

- Keep dry
- Avoid conducting overhead lines
- Do not use cell phone during operation
- Do not process any measurement during thunderstorms
- Accurate operation is only guaranteed with a fully charged accumulator
- For operation or loading only use the components enclosed or released by KTS.

1.3 Scope of delivery

Hardware:

- GPA DUO XL electronic unit with Bluetooth®, incl. installed lithium-ion accumulator and shoulder strap
- GPA probe 48 cm long (18.89”) incl. 2-piece carbon telescope bar
- Gold detector search coil 25 cm (9.84”) incl. 2-piece carbon telescope bar
- Gold detector search frame 1 x 1m (39.37 x 39.37”), 8-fold demountable (incl. bag)
- Tablet PC with pre-installed software incl. lithium-ionic accumulator
- Powerful fast battery charger with power inverter 220 Volt, car-loading cable and 110 Volt adapter
- Solid hard-top case

Software:

- GPA KTS 3D Software with 5 basic colors (installed on PC)
- USB stick with software for processing data on other computers

Service:

- English, German, French and Spanish user's manual
- 2 year manufacturer's warranty for the entire scope of delivery (including hardware and software)

Chapter GPA

2 Hardware operation

2.1 Assembly

Contrary to other appliances the assembly is very simple.
Plug the bar into the mount of the probe and insert the remaining parts in correct order. The universal probe can be attached to the holder now. Afterwards the sensor cable must be connected. Now your device is ready for use.

Fig.: 4-part demountable universal probe

Fig.: Telescope bar

Fig.: Telescope bar - disassembled

2.2 Front

Turn-switch: The turn-switch has 3 positions:

- OFF The device is switched off.
- BAT Current battery voltage (between 7 and max. 8.2 Volt).
- SENSOR Display shows sensor values.

Toggle-switch: SENSOR/CALIBRATION

- Sen. Shows battery voltage (BAT) or current value sensor (SENSOR).
- Cal. Shows calibration value.
- After activation blue LED flashes, constant lighting signalizes Bluetooth-connection

Fig.: front of electronic unit (GPA DUO XL)

The left side shows the GPA element

The pulse induction element is arranged on the right side.

2.3 Activation of electronic

The Bluetooth-connection allows a fast and save transfer of measured data to the PC – contrary to other devices, which record data via parallel interface.

To control the current charge of battery turn the knob to BAT. This value must always lie over 7.5 Volt (otherwise charge the battery). Then switch to the position SENSOR or ECO to read the sensor or calibration data. The sensor data should always lie between 0-50, the calibration approx. 25 (before the calibration automatically is set it could temporarily show other values).

Fig.: Complete electronic unit with PC

3 Program start

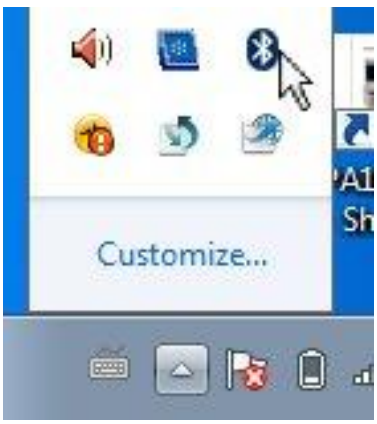
After booting the PC and double-click on the KTS-3D icon start the KTS software. GPA DUO XL will automatically be connected to the computer (be sure that GPA DUO XL is turned on ***before*** you start KTS 3D-Software). Should this not be the case, we refer to 3.2.

3.1 Driver reinstalling (with reinstalling of Windows)

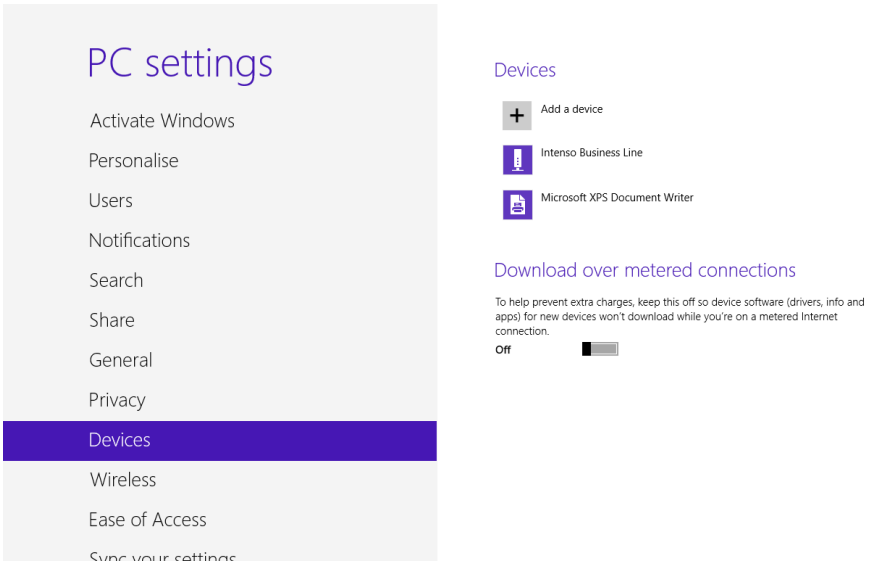
In case you want to connect another laptop (with Bluetooth-connection) to the main unit or if you have to reinstal Windows please copy the entire data content from the provided USB stick to the hard disc. Additional software is not necessary. Now your tool is operational and ready for use.

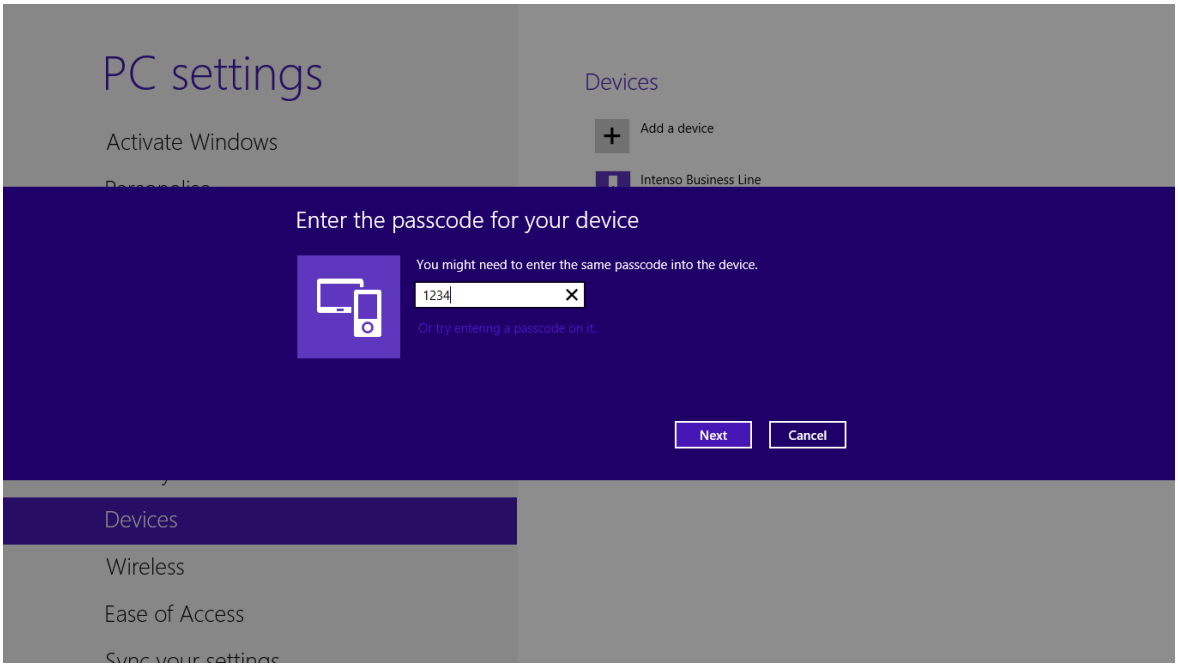
3.2 Bluetooth pairing

The Bluetooth symbol appears in the menu bar. With a right-click on this symbol the **add a device**–window will show all available Bluetooth functions (it is necessary that GPA DUO XL is activated and the blue LED flashes).



Select **Ezurio Blu 2I**. In the next window insert the password **“1234”** and go to “Next” (the device will automatically instal the suitable drivers). Finally click the Close-button to conclude the procedure.





Click on the Bluetooth icon in Windows Taskbar, “Open Settings”, “COM Ports” – and keep the Outgoing COMPORT number in mind. After that open KTS 3D-Software, click on “Options” → “Serial Interface”, select the memorized COMPORT and click “OK”. Restart the software and the device will automatically be connected to the computer. The LED lights up permanently and GPA DUO XL is operational.

For additional application you only should see that Bluetooth is active and GPA DUO XL is turned on (above proceedings must not be repeated).

4 The search process

During soil analysis several search modes are selectable:

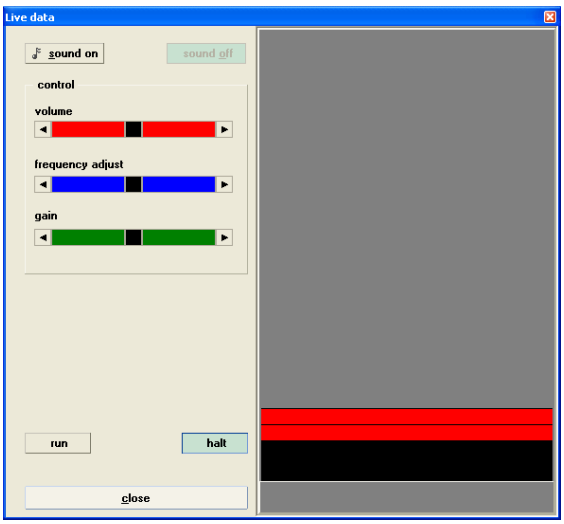
4.1 Search with the universal probe

- Wireless connection via Bluetooth from computer to electronic unit.
- Turn the probe in such a way that the arrow (see at the side of probe) points to the ground during the search (this way you will attain the highest search performance).
- After engaging the electronic and check-up of battery condition turn the turn-switch to sensor position.
- Check the calibration over the toggle-switch (approx. 25).
- Over toggle-switch turn back to sensor position. Assure yourself that the indicated value lies between 0-50. Should this not be the case, change the search direction slightly so that the value stands between 0-50.

Further particulars about the searching procedure you will find under 4.3.

4.2 Live mode

It is reasonable to roughly scan large areas in the live mode at first, so that in the following the control in 3D is more precise. If the live mode stops unexpectedly, press the “start” button again and continue with the search.



4.3 3D search mode

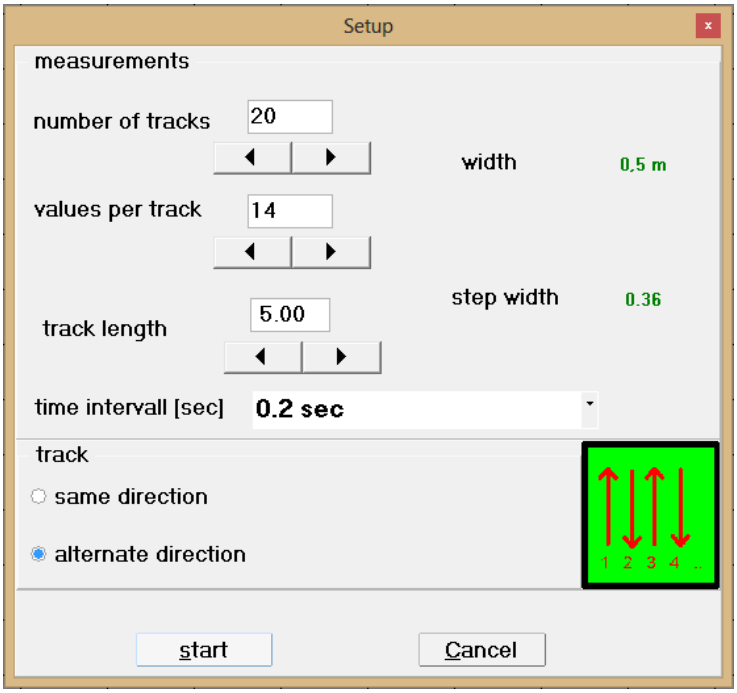
For precise ground examinations the area must be divided into tracks. The tracks can be scanned in same direction or in alternate direction. The moving direction is selectable in the settings window.

The track length can be determined differently (during the search after large objects or excavations longer track lengths can be selected;.for the search after small items shorter track lengths are recommended).

4.3.1 Preadjustment

With the "new" button on the screen the adjusting plane opens and

the computer requires the input of track number, track length, values per track and measurement speed, etc.

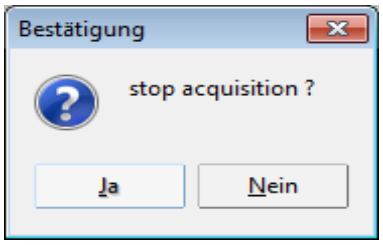


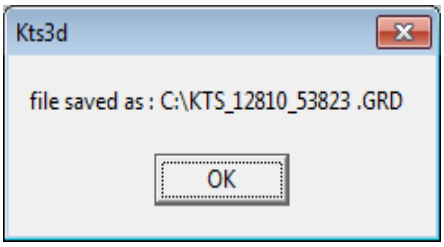
4.3.2 Start-button

By pressing the start button the search begins. On screen the results are displayed 2-dimensional. After all values are measured, the program stops automatically and is ready for the next track.

4.3.3 Completion of measurement

After ending of the last track, you are going to be asked if you want to store the measurements. With the O.K.-button the measurement is stored automatically in a user-defined file.



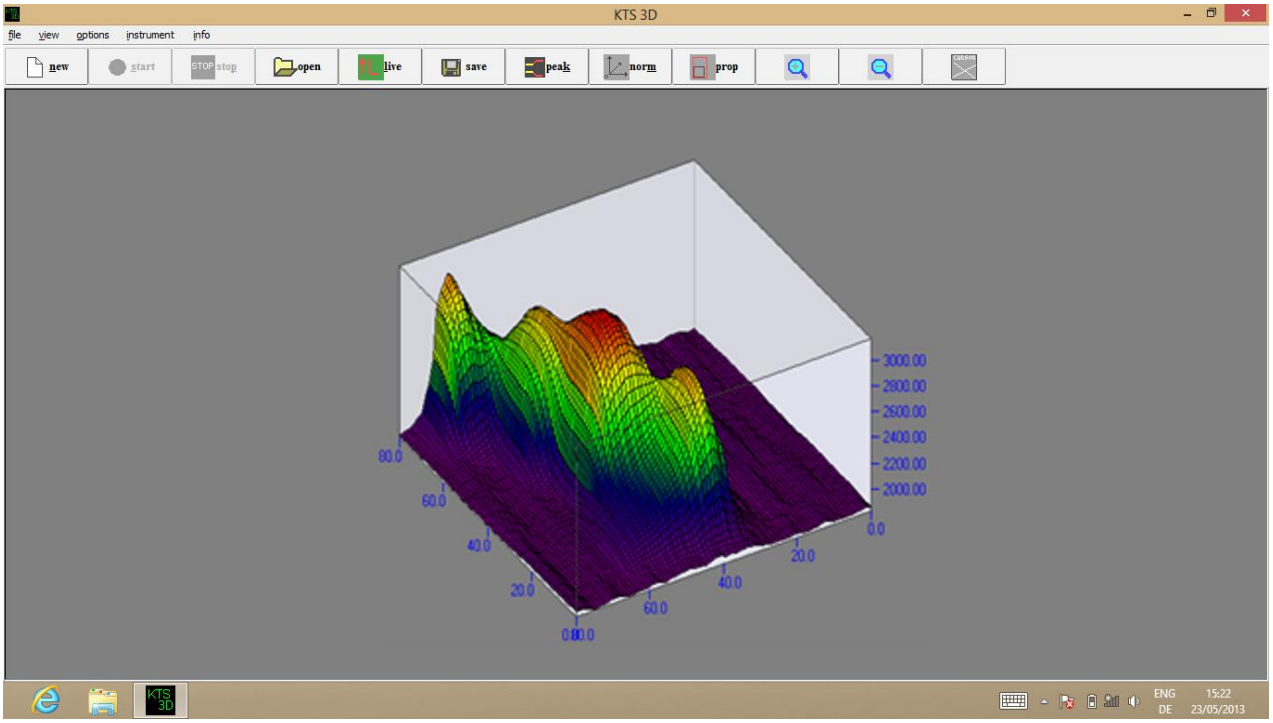


4.3.4 Transfer of measurement data

The provided USB-stick can also be used for the transfer of measuring data; you are able to transmit to other PCs and call up all informations for further processings.

4.3.5 3D presentation

The measurement data is shown 3D.



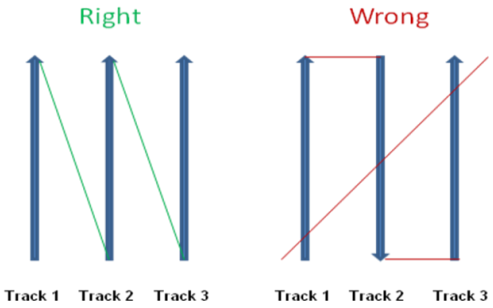
The 3D presentation shows every modification and its dimension.

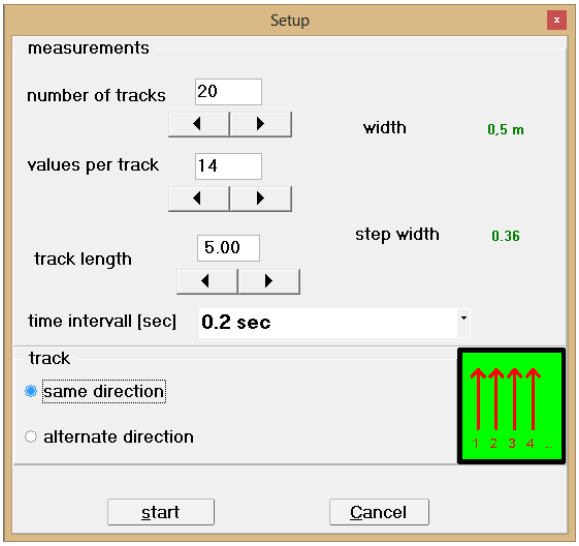
4.4 Search process (measurements)

The GPA DUO XL is a gauge, which can measure alterations of ground anomalies (caused by metal objects, soil structure or excavations) and is also able to discriminate from normal ground magnetism. Correct results strongly depend on ground type and measuring method. Areas to be measured should not have electric fields (like high voltage cables or earth wires), strong mineralising or wet grounds because they influence the measuring. The dryer the soil, the more precise are the results.

Split the area you want to measure into even tracks. You may choose between 2 methods:

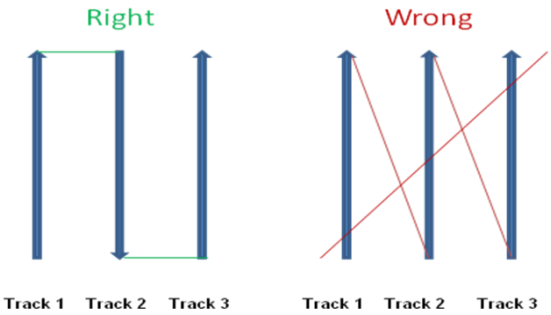
4.4.1 Search with rectification





If you have chosen the search in rectification, you should come back to the starting point after completion of each track and press the start button (for the measurements of the second track).

4.4.2 Search in counter direction



If you have chosen the search in counter direction, you should turn around after completion of each track, step approx. 50 cm to the right and continue directly with the next track by pressing the start button.

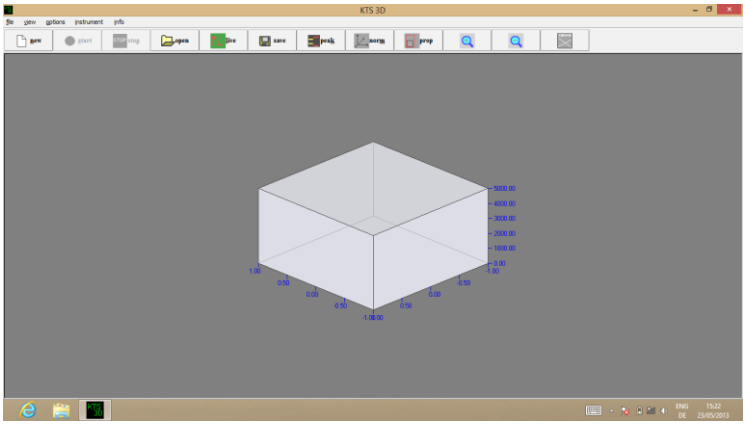
For precise measurements you should keep the search speed in a steady manner while you are walking the tracks. Hereby objects can be detected at the same spot during counter direction. For exact measurements track lengths between 5 to 10 Meters are advantageous.

5 Program operations

The program serves as indication of magnet field data in colored, three dimensional representation.

5.1 Main window

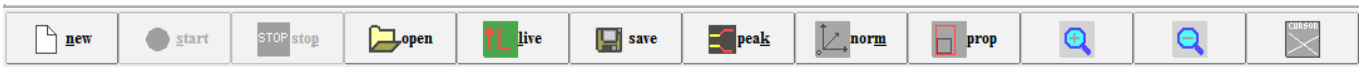
After start of program the empty main window appears with the menu bar, the tool bar, the adjustment and the indication area.



When the program starts the display range is empty at first.

5.1.1 Toolbar

Some buttons are combined for fast operation. These are from left to right:



- ☐ New start of set-up for data acquisition
- ☐ Start starts a data acquisition
- ☐ Stop stops the current data acquisition
- ☐ Live starts the live mode
- ☐ Open reads a stored file
- ☐ Save saves the current file
- ☐ Peak switches between absolute and relative representation
- ☐ Norm resets main-representation to basic setting
- ☐ Prop switches between proportional and quadratic representation
- ☐ Zoom in and out with buttons [+] and [-]

5.1.2 Display range

The display shows a 3-dimensional, colored presentation of the measured values. The presentation can be rotated with pressed left mouse button.

5.2 Menu bar

5.2.1 Data menu

The data menu indicates entries to open and store measurement data. The stored measurement data is marked through the ending GRD.

- ***New*** starts a data recording with connected external measurement hardware. A pop-up window appears for the adjustment of measurement conditions.
- ***Copy into clipboard*** copies the current view into the temporary storage, so that it can be inserted into every image editing application.
- ***End*** ends program.

5.2.2 Display menu

In this menu you can switch between graphic and numeric view of measurements.

5.2.3 Options menu

With the options menu item a new window for the adjustment of program options shows up. A description of various possibilities occurs there.

5.2.4 Info menu

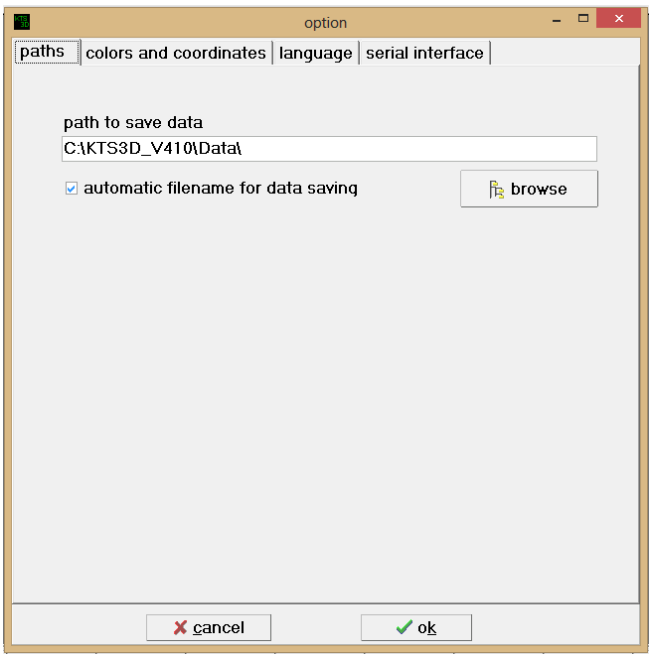
Delivers informations about the present version.

5.3 Options window

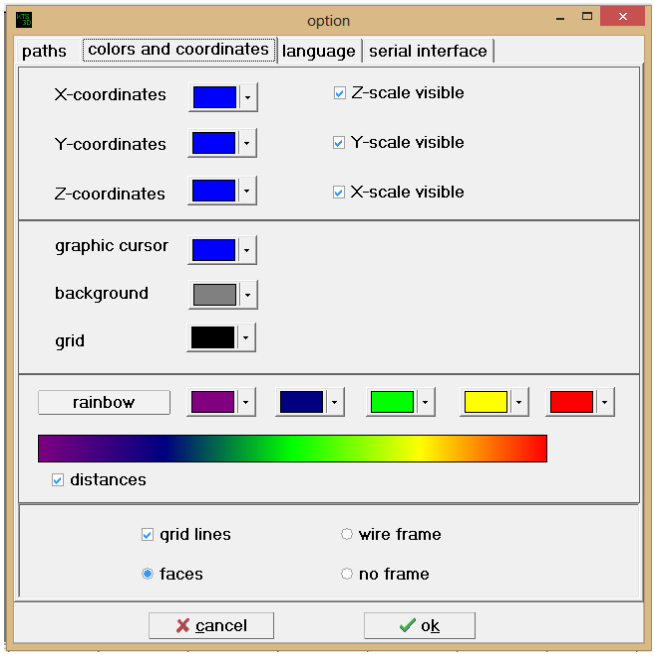
The options window is divided into four categories.

5.3.1 Paths

With the path adjustment the index is defined for data storage. A selection dialogue appears after the [search] button is activated.



5.3.2 Colors and coordinates

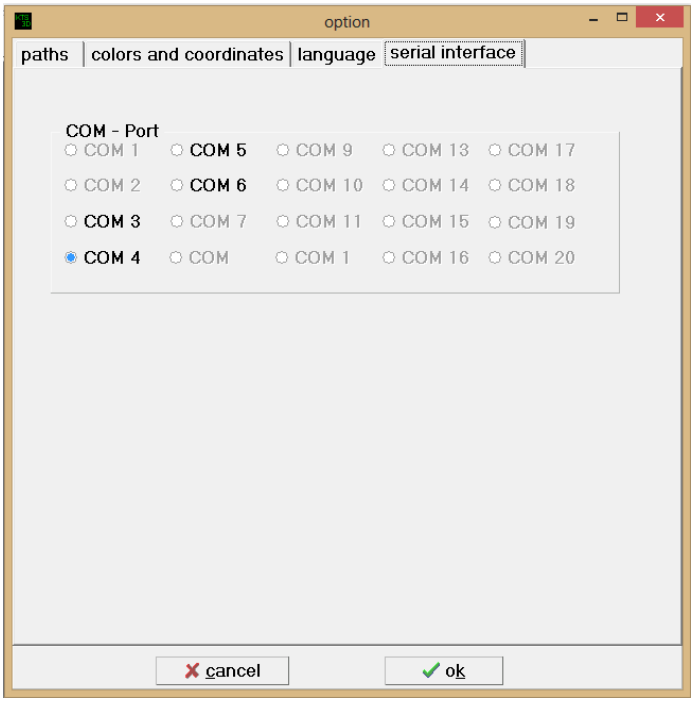


Here colors for the coordinate display, graphic cursor and background can be selected. After the appropriate corresponding buttons have been activated, a color-selection dialogue shows up.

5.3.3 Languages

For operation the program can completely be switched to languages shown below.

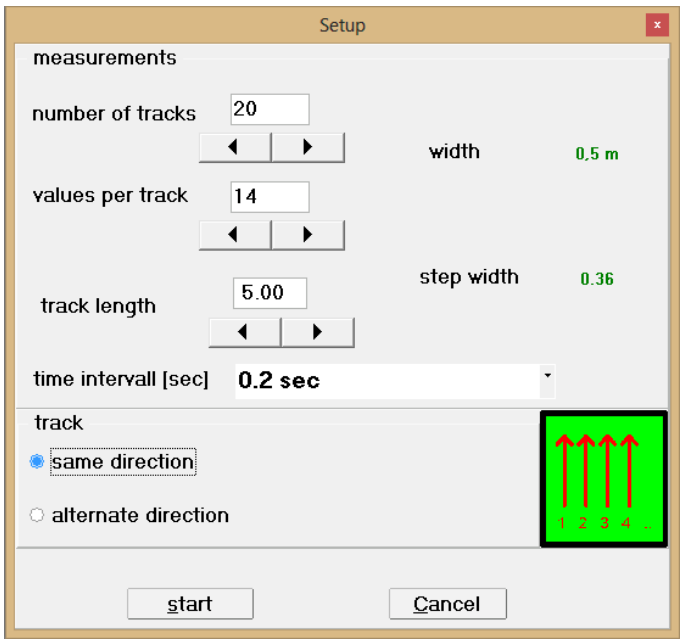
5.3.4 Serial Interface



Should a reinstallation be necessary, select the utilized Comport (see 3.2 Bluetooth pairing).

6 Data recordings

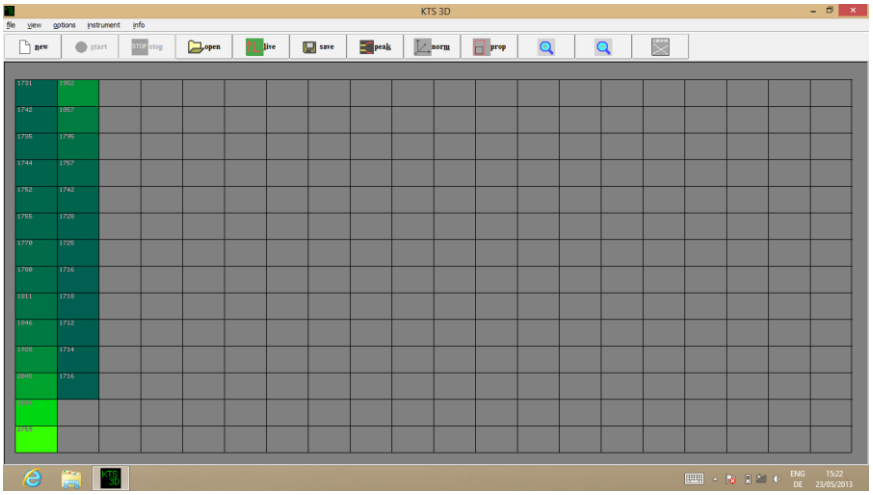
6.1 Adjustment before data recording



Before data acquisition various settings are essential. The track length defines – together with the values per track – the distance (see field *step width*) between every single measurement. The values per track are limited to 100 maximum.

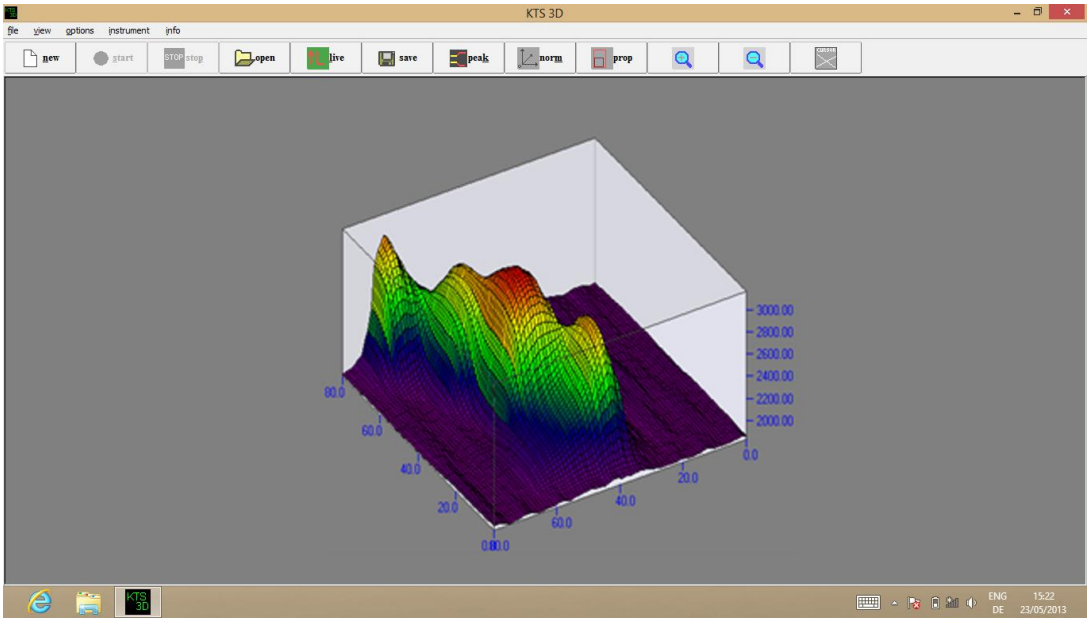
After pressing the [Start] button the measurement is activated; this can be carried out either manual or time-controlled (standard setting is 0.2 sec). With the [Cancel] button a program termination is possible at all times. The shift between consensual and contrasensual movement is also possible.

6.1.1 Display during data recording



During data recording the display turns up two-dimensional and in colored grading. Of course, the shown colors are dependend on the selected modulation. The end of a track is displayed, after confirmation the new track will be measured. A storage request appears at the end of the last track; afterwards a switch to the three-dimensional representation takes place.

6.1.2 Display after completion of data recording



Above illustration results from the under 6.1.1 shown two-dimensional representation.

6.2 Display alternatives

6.2.1 Representation proportional or quadratically

With the button [prop.] the representation switches between proportional and quadratic view. In the quadratic representation the display occurs with square elements. Details partially are better recognized here. The relation between track length to field width is not taken into account. The proportional representation is displayed under consideration of the real track length and field width like it was adjusted in [data recording].

> **Note:** The actual measured length / width is only given through the setting [data recording]. The correct input of the exact length and width is essential.

6.2.2 Data presentation - absolute or relative

It is possible to switch between absolute or relative data presentation. With the absolute presentation the Z-axis is expanded to the full available measuring range. With the relative presentation the value range is based on the smallest resp. the largest measured value. This way a maximum detailed resolution is obtained which also has effect on the color representation.

Chapter Pulse Induction

7 Installation

The installation of the metal detector is uncomplicated and requires only minimal adjustment.

1. Assemble the telescope bar by positioning the mean tube (aluminum tube – adjustable in length) into the tube of the arm-rest.
2. Connect the telescope bar with the aluminum tube of the search coil.
3. Wrap the search coil cable around the aluminum tube and plug the search coil socket into the panel jack.

8 Appropriate handling

Hold the search coil approx. 2 to 5cm parallel to the soil. Due to the pulse induction technology a rotation of the search coil is not necessary.

Determine your own speed during the search. To search a large area without expenditure of time we recommend a speedy pace (no jogging).

9 Adjustment

The pulse induction parts can be adjusted in no time.

1. Activate the metal detector with the turning knob “MODE”. At the same time determine the sound volume.
2. Briefly press the RESET-button in order to obtain a zero balance which is necessary for a failure-free search.
3. Regulate the FREQ.-modulator until a slow ticking signal is hearable. This signal is acoustically similar to a seconds counter.

10 Application of RESET-button

The function of the RESET-button is significant; the button should be activated after every modification.

1. After every turn-on procedure,
2. after every change of MODE-function,
3. after every swap of a search coil
4. during the search if sound gets unstable due to poor soil conditions or earth magnetism.

Look to it that the sound is constant. Should this not be the case, it is possible that a magnetic field caused a misadjustment. To solve this problem please use the RESET-button.

Look to it, that during zero balance no metal objects are located in the immediate vicinity. This can produce a false calibration and unwanted indication effects.

11 Metal indication

The indication of a metal will be signaled through the green LED and the pulse tone.

The device has a sound location system. With the approach of the search coil at a metal object the tone frequency will rise. As soon as the soil is exactly positioned over the object, the highest tone is reached.

With this method not only the exact spot of discovery is located, it also detects – based on the duration of the sound – the object’s shape.

Examples:

- A prolonged tone in longitudinal direction indicates a narrow object (e.g. a tube),
- a high tone in any direction leads to a ringlike object.

12 Search process

To make the search results-oriented and for this reason successful, the following facts should be kept in mind:

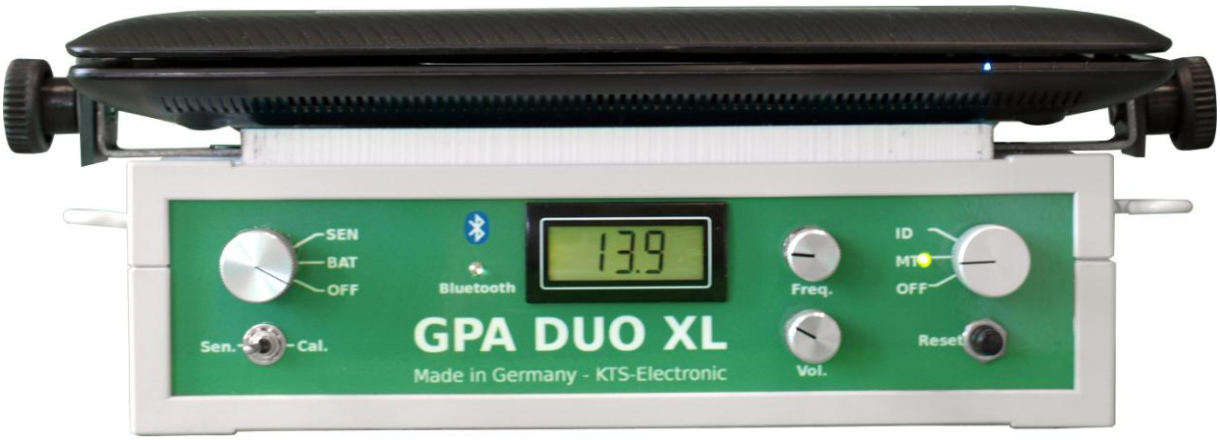
- modification of the tone (frequency)
- intensity of the tone
- duration of the tone
- level of value (display)

The modification of the sound is the first sign for the location of a metal object. The more intensive the tone, the larger the metal object and the nearer it is located to earth's surface. While the tone is hearable, the search coil should be moved in the near vicinity so that the possible shape can be found out.

The simultaneous attention to sound **and** display value leads to a better analysis of the discovered object.

13 Electronic unit (pulse induction side)

The electronic unit is installed in a high-quality box. Besides the display there are 4 control elements attached to the front namely on the right side.



FREQ.:
Frequency setting controller. The metal detector should be aimed at the object you are searching for. Please proceed after the following rule of thumb: The smaller the object you are searching for, the smoother the adjustment must be.

RESET:
Automatic zero balance. By pressing the RESET-button the device will be adjusted unto the respective ground.

Display:
Visual indicator for metal discrimination and battery condition control.

Green LED:
The optical display in the MT and ID mode is carried out through the flashing of the LED.

MODE:
The MODE-knob can be switched to 3 positions:

ID:
In this search mode the discriminator comes into operation. Thereby an optical and acoustical discrimination takes place. The respective metals will be signaled through various sounds and conductivity values.

Examples for differing conductivity values:

- light metals (e.g. aluminum) ca.25
- copper ca.35-45
- gold, silver, platinum 100 and over

MT.:
This search mode displays all metals without discrimination. Here the metals will not be tested for their conductivity but they will be shown acoustically and optically through the digital display. This has the advantage that the search will be carried out with the highest sensitivity. At the same time a depth measurement takes place which is visualized by needle deflection. The shorter the needle deflects, the deeper the metal is located. Furthermore shape and size of the located object can be determinated through needle deflection.

OFF:
The metal detector is switched off.

AUDIO:
Volume control.

14 Electronic unit (back)

There are 3 connection sockets at the back:

- Socket for coils (pulse induction side):
  The connecting socket of the search coil is arranged on the left-hand side. Before removal of the plug the lever has to be pressed, then the plug can be pulled out, not ill then an extraction is possible. The connector is compatible with all search coils.

- Charger jack

- Socket for probes (GPA side):
  The connector for the probe is arranged on the right-hand side. It can be removed by pressing the push-button under the plug.

15 Application of appropriate search coils

According to the purpose the metal detector is applicable with various search coils.

25cm search coil
The 25cm search coil is the standard probe and particularly suitable for the search after small metal objects.

1x1m search frame

Preferably used for the deep sounding after medium-sized and large metal objects.

During the search you should hold the search coil between 20 to 50cm over the ground. The higher the distance to the soil the less small and medium-sized metal objects are displayed.

Assembly of the 1x1m search frame

1. Connect the pipes (8 pieces) in numeric order. Please note that the numbers should be readable on the upper side.
2. Arrange the search frame on a flat surface and assure yourself that the frame is not distorted.
3. Place the cable on the pipe and fix it at the corners with the provided tape. Please be sure that cable and search frame are firmly connected to each other.

Turn off the metal detector in case you want to switch to another search coil, then connect the selected search coil. Press the RESET-button after you have started the detector again.

16 Error signals

In line with the development of your GROUND PENETRATING ANALYZER DUO XL great emphasis was placed on stability and the avoidance of incidences to create a preferably undisturbed search. Despite the multiplicity of filters and modulators it is unfortunately possible that certain soil conditions cause adverse effects, which can influence your measured values. Apart from a wrong soil balance modulation incorrect signals can arise by the following effects.

1. Ferric oxide: Through magnetic ferric oxide soils the conductance of the located metal can comprehend falsified data.
2. Anomaly effects lead to the fact that large iron metals are indicated as precious metal.
3. Small parts of bronce partially may be indicated as iron, the preciseness of measured values therefore is guaranteed only from a dimension starting from 5x5cm.
4. The probability of false measurements is also given if other metals are existent near the located metal parts.
5. Strongly magnetic interference fields within residential areas and in the proximity of ground cables can influence the measured values.
6. Disturbances often appear in the peripherals of radio stations.
7. Strongly magnetic fields, particularly in the proximity of high voltage pylons, can cause disfunctions.

16.1 Accumulator and charger

The strong power is supplied by an installed 2800 mAh Lithium-Ion-accumulator, which can be loaded with the high-speed battery charger within 3 hours. The actual working time amounts to, depending upon coil size and usage of headphones, approx. 6-12 hours. The loading procedure is indicated by the orange light emitting diode, the green light signals the end of the loading. After each loading procedure the connector cable for the battery charger should be removed.

A voltage transformer enables loading in the car.

17 System requirements and license agreements

17.1 System requirements

The program is a 32-bit-application, which is driven under Windows 98, Windows 2000, Windows NT, Windows XP or Windows 7. As minimum requirements for an adequate usage the PC should show the following configuration:

- Processor with pulse frequency from 1000 MHz or more
- Hard disc with approx. 10..20 MByte free storage space
- Graphic card with a minimum resolution of 800 x 600 points
- Bluetooth ability to the connection of the external measuring hardware

17.2 License agreements

The program KTS 3D as well as the entire accompanied electronic or printed documentation is subject to the copyright of KTS-Electronic Co. If parts of the present license regulations should show alterations or expansions opposite the license regulations for former program versions they will come into force from the beginning of the day of entry.

The present license regulations become effective on May 1st, 2007.

Through the utilization of the software the user agrees to the present license regulations. The right of use automatically will cease if the license regulations are ignored.

17.3 Utilization regulations

After full payment of the invoice amount the customer is allowed to a not-exclusive right of usage of the program listed in the bill. This right is restricted to the owner of the original software. Consequently, the software can be used only on one single computer system at the same time. All present and future copyrights and/or industrial protection rights of the provided programs and of all programs derivative from it, program modules or in this context produced records remain at KTS-Electronic.

17.4 Liability exclusions

The present program was tested carefully, nevertheless mistakes are not to be excluded. No guarantee is adopted for the usability of the program to a certain purpose. Especially, no liability is adopted for consequential damages as well as profit and asset losses, that could result from the application of the program as well as the affiliated documentation.

Prices may change without notice. The same applies to changes any sort in software or documentation.

18 Warranty

24 months from date of purchase we grant repair works free of charge due to factory errors originated by mistakes and defects.

According to the following conditions (see below) we remedy deficiencies free of charge, if they are evidently based on manufacturing errors or defects and are reported to us immediately after assessment of damage within 24 months after delivery to the ultimate buyer.

Defective parts will be repaired gratuitous or will be replaced by efficient parts of our choice. KTS reserves the right to exchange a device by an equal valued replacement unit in case the returned product cannot be required in an appropriate budget time frame.

On-site repairs cannot be demanded. Replaced, resp. exchanged parts will merge into our property.

The guarantee claim expires in cases of improper handling, gross carelessness or when repairs, modifications, additionally installed parts or extentions are carried out from persons which are not authorized on our part to do so.

Guarantee claims will neither effect an extention of the term nor they will implement a new time limit.

Further requirements, in particular such through extraneous causes resulting damages are excluded, unless a commitment is not necessarily the case.

We therefore are not liable for any accidential, indirect or other subsequent damages of any kind, which lead to limited use, data loss, profit setbacks or operating failures.

18.1 After expiration date

KTS can agree upon a service after expiration of guarantee. In this case repairing and shipment will be charged.

18.2 Legal note

Before you start searching please note that the monument protection as well as other legal standards are relevant. KTS-ELECTRONIC assumes no responsibility for possible legal violations.

In case of doubts we recommend a comprehensive consultation with an attorney or national monument offices.

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Fridays: 9:00 am to 16:00 pm