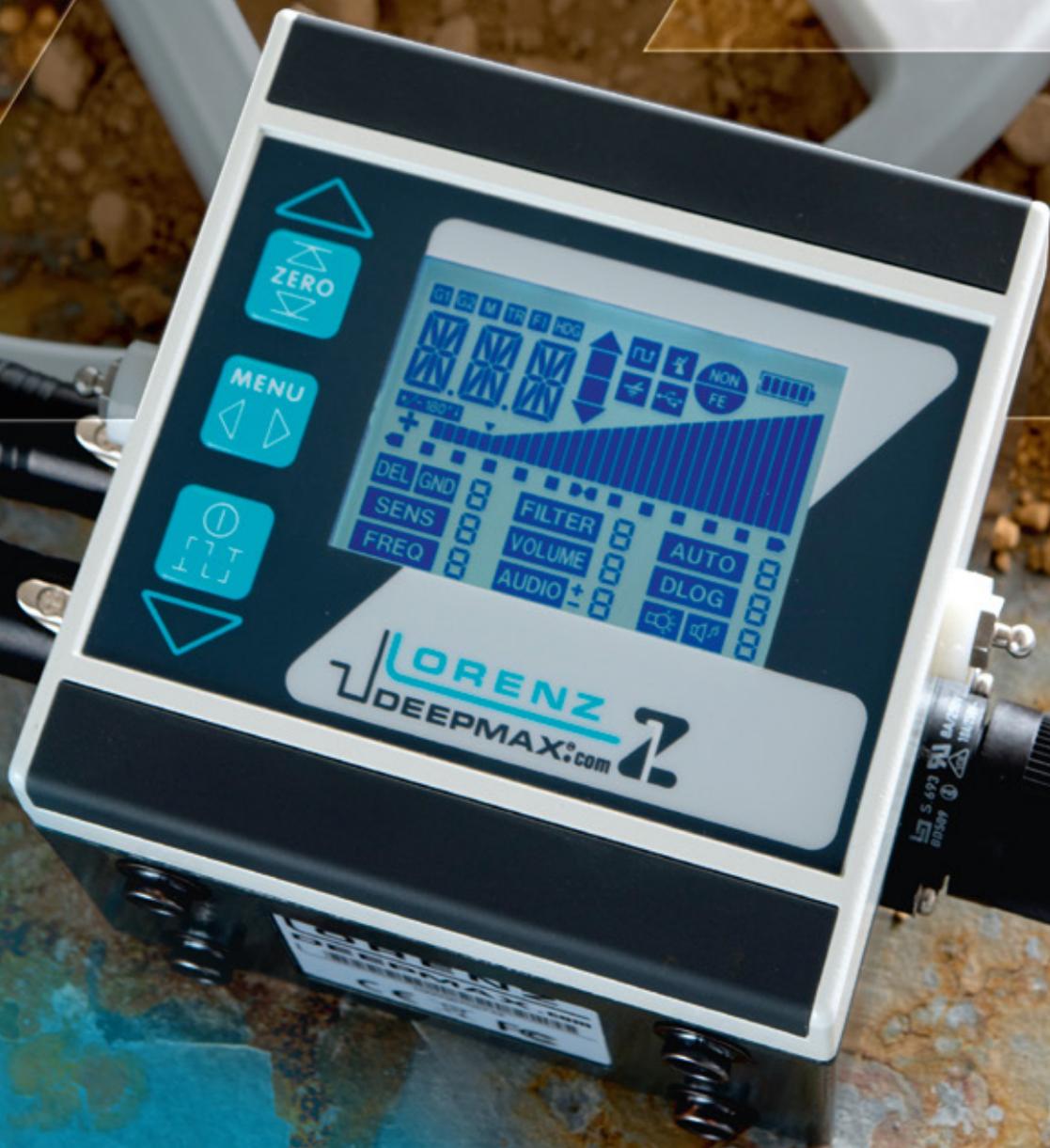




LORENZ

# OPERATING MANUAL



## Declaration of conformity / EMC directive

The following metal detector  
LORENZ DEEPMAX Z1

Correspond to the following EC requirements:  
EC-EMC-directive version 89/336/EEC

The LORENZ DEEPMAX Z1 series are found to meet the  
specification requirements detailed, when tested to the  
customers/ specification requirements.

Compatible norms are in particular

Test Specifications & Categories

EN 61000-6-3:2007 + A1:2011

EN 61000-6-1:2007

EN 55022:2010

EN 55024:2010

EN 55016-2-3:2010 + A1:2010

EN 61000-4-2:2009

EN 61000-4-3:2006 + A1:2008 + A2:2010

FCC 47 CFR Part15

Refer to certificate of testing No: F 132633 E1 / F 132633 E2

If any changes are made to the above mentioned appliances without  
consulting Lorenz Detecting Systems GmbH & Co. KG this declaration becomes invalid.

Date: 18.06.2013 Signed:



Lorenz Detecting Systems GmbH & Co. KG  
General Management

## Introduction

The LORENZ DEEPMAX Z1 series detectors are some of the newest developments in the field of Pulse GBS metal detectors. It is probably one of the most sensitive and stable metal detecting devices of its kind presently available. The LORENZ DEEPMAX Z1 is the result of many years of research and development. A lot of efforts have been put into making this new product and especially in the new improved metal classifications and automatic ground balancing facilities.

The Pulse GBS (Pulse Ground Balancing System) is especially suitable for searching at depth. The performance of this electronic device is almost unaffected by salt water, most types of mineralized grounds or temperature changes. Specially designed electronics cancel out signals from the ground while offering stable signals from the metal objects. The DEEPMAX Z1 is therefore a reliable tool to locate at great depths even under the worst environmental conditions. A new improved circuit design suppresses interference from power lines and a power pulse technique produces very accurate signals to obtain very high detection depths.

The LORENZ DEEPMAX Z1 is a high quality specialist Detector and it is designed to be used with both, small or large coils. Large coils offer extreme depth capabilities for big metal objects because of the strong and deep going magnetic field produced. Small coils are preferably used while searching for small objects like single coins or gold nuggets.

This model offers a great range on non-ferrous metal objects in general. A very simple operation is guaranteed by a specially developed LC Display and a minimum amount of controls. At the same time this detector model offers a number of features which are new for a pulse metal detector. Quality electronics and very special designed electronic - circuitry produce benefits in terms of ease of use as well as sensitivity.

The DEEPMAX metal detectors are often recognized as representing some of the highest quality and newest developments in professional metal detecting equipment.

We as a manufacturing company always try to keep the highest standard on our products, therefore alternations of the design, specifications as well as the availability subject to change without notice.

## 1. Safety information

For reasons of safety it is advisable to read this operating Introduction manual first before turning the LORENZ DEEPMAX Z1 on. Special attention should be paid to the

following notes.

Check out, if the charger supplied with the DEEPMAX Z1 fits with the AC mains of your country. See chapter 12 for more detailed information. The supplied charger will work at AC voltages of 90-264 VAC.

Damaged connecting cables or search coils should no longer be used, because of possible electrical shock.

To avoid short circuits, wrong polarity or electrical shock, only spare parts and accessories offered by the manufacturer of the LORENZ DEEPMAX Z1 should be used. When headphones are in use please reduce volume to protect your ears.

When digging for metal objects war material could also be found. Precautions should be taken in advance especially when big objects have been located.

Special kinds of mines could be triggered by the strong DC magnetic field produced by the search coil. Persons with implanted pacemaker or other sensitive device should not approach to the field of the search coil. Please understand that we as the manufacturer of the LORENZ DEEPMAX Z1

cannot be made liable for any kind of damage caused by or in conjunction with our products.

Design and specifications subject to change without notice!



## 2. Function

The LORENZ DEEPMAX Z1 is based on the non-motion; Pulse GBS (Pulse Ground Balancing System). Short and

intensive magnetic pulses are emitted by means of a search coil first. Those magnetic pulses produce eddy currents in conducting materials like metal objects for example. Said eddy currents will be kept in a metal object and will die away after the magnetic pulse emitted by the search coil has turned off. This is the reason why it is possible to detect those eddy currents during the time delayed receiving phase by means of the same search coil which now acts as a receiving coil. A rather complicated electronic circuitry is necessary to detect those tiny voltage changes and has to separate that particular signal from interference also received. The signal has to be amplified to drive an audio stage with voltage controlled oscillator (VCO), which emits an audible signal either by headphones or built-in loudspeaker when a metal is in the near of the field of the search coil.

Eddy currents produced in a metal object by means of a pulsed primary field, will die away differently depending on the conductivity of the metal object. The classification circuit therefore gives a visual time delay reading for the eddy currents received over a certain period of time. In addition a ferrous/ non-ferrous indication for a metal being detected is working when a double D coil is in use. This gives further information on the probable kind of metal being located as well as the audio sound emitted, which makes it easy to predetermine the exact place and the size of the buried metal object.



## 2.1 Advantages

The Pulse GBS principle has got the advantage of using large diameter coils and high transmitting power. This is especially necessary when searching at depth. Frame mounted cable coils of different size and shape can be connected to the LORENZ DEEPMAX Z1 without any adjustments.

A special adaptation circuit has been added to the Detector to suit with different coil systems automatically. This ensures extreme depth capabilities with any coil connected. When enlarging the search coil diameter the sensitivity to bigger objects will also rise. At the same time smaller objects will be located less sensitive. This is particularly desirable when locating large objects while ignoring small bits. Large coils offer very high detection ranges. Even in difficult soils where magnetic iron oxides are present the LORENZ DEEPMAX Z1 will offer extreme depth capabilities for both ferrous and non-ferrous metal objects when the Ground Balancing System is in use. Other systems often suffer from ground effects which reduce the depth range in the ground. The LORENZ DEEPMAX Z1 will be able to locate objects at almost the same depths either in most types of ground or »in air tests«. The high sensitivity of the DEEPMAX Z1 to non-ferrous metal objects like gold, silver and copper together with the new metal analysis make this detector an outstanding device for many different locating purposes. The DEEPMAX Z1 gives a visual indication on the LC Display for every metal being located. This time delay reading producing a number between 000 and 099 helps to classify metal objects. The metal classification circuitry is only in some cases affected by the size of a metal object and therefore identifies small coins as well as large pieces of metal. The LORENZ DEEPMAX Z1 also offers a sophisticated and refined ferrous / non-ferrous metal analysis which works more stable on difficult soils in conjunction with the 26cm or 35cm double D search coil. The Detector also emits an audible sound by way of either a speaker or headphones. Detection depths achieved (in air tests) are almost the same in many types of soils and therefore considerably higher than those possible with standard pulse induction or sine wave VLF - TR Detectors.

The DEEPMAX Z1 was developed to provide a number of features including high sensitivity and stability together with easy operation. The amount of controls was therefore reduced and a calibration of the detector to our factory settings was also made to guarantee best results in the field:

- Highly sensitive to all kinds of metal
- Stable operation on mineralized ground or salt water with Pulse Ground Balancing System
- Reliable / simple operation with few controls and customized LC Display
- Exact pinpointing with large coils
- Very easy and effective detection of large areas
- Rugged, refined mechanical construction with water and dust protected electronics unit
- A variety of search coils are available for different detection purposes
- Automatic adaptation of different coil sizes and coil designs to the electronics
- Small unwanted metal objects can either be identified or eliminated

- Fast audio response speed with different audio settings
- Logarithmic audio response and intensity bar graph reading for easy pinpointing
- Battery check with audio alarm tone
- Calibrated metal classification with visual conductivity/ time delay reading
- Improved ferrous/ non-ferrous identification
- Precisely adjustable audio-threshold
- Stable static response (acoustical and visual)
- Waterproof search coils
- Interchangeable rechargeable Battery for worldwide operation.
- Charge electronics for worldwide operation 90-265V AC/50-60Hz
- Frequency and Filter function for low frequency EMI interference elimination
- Automatic ground calibration retuning facility
- Different Delay and Sensitivity settings to eliminate small objects or for easy pinpointing
- Extreme detection depths for very large metal objects
- Specialized on gold and improved detection range on low conducting metal pieces
- Low frequency interference elimination circuitry for less interference in urban areas.
- High dynamic range for extreme ground signals and easy pinpointing
- Optimal performance for the detection of small objects like coins or other non-ferrous objects
- Single or dual, induction balanced or differential coil designs can be used
- Multi sensor trigger detection (MST) with several search coils working at the same time without interfering each other. Please ask for details.
- Easy to use data logger function works with additional Hard- and Software kit to generate six 2D image and six 3D surface maps from the scans being taken. Each map is different depending on the electronic analysis method and therefore can be the key to the probable kind of metal buried in the ground.
- GPS based Meter and Compass Heading information, makes it easy to work with the data logger.
- New search system circuitry with all new functions.
- Signal strength bar graph, time delay reading, ferrous/ non-ferrous icons, battery condition and all the mode settings are displayed simultaneously on a large LC Display.

## 2.2 Applications

The LORENZ DEEPMAX Z1 was developed for professional search and locating applications.

A variety of search coils can be connected to this metal detector. Large areas can be detected effectively especially with frame coils. Saltwater, most types of ground or temperature changes will only slightly affect the detection range of the DEEPMAX Z1. It is possible to eliminate some unwanted objects like nails and foils or to identify them as being small unwanted objects while searching for bigger and deeper objects. In conjunction with small coils the DEEPMAX Z1 is a great tool when searching for small objects deep in the ground.

### 3. Z1 instructions

On the front panel of the DEEPMAX Z1 there are three push buttons namely **ZERO**, **MENU**, and **POWER**. The data logger function can also be operated by means of the same controls when the data logger function is turned on.

1. Assemble the coil with the telescopic pole and put on the carrying strap with the battery and electronics unit
2. Connect the battery and coil to the Z1 electronics unit
3. Press **POWER** shortly, when **LOW BAT** appears charge the battery first
4. To start the automatic two steps Ground Balance hold the coil in the air and press **ZERO** until a high beep sound is coming
5. Afterwards lower the coil to the ground without moving at a place with no metal and press **ZERO** again until a second low beep sound appears. Arrows pointing up- and downwards indicate the position of the coil.
6. Select the functions by pressing **MENU** shortly jumping to the next function or going backwards while pressing **MENU** for a longer duration
7. Select the values with **ZERO** upwards and with **POWER** downwards quickly pressing the same button repeatedly.
8. After three seconds the icons will stop to flash automatically. Press **MENU** again in order to change functions
9. Most functions have a lower sensitivity/ intensity in position 1 as a higher setting like 4, 5 or 9 will result in a higher sensitivity/ intensity/ brightness/ loudness/ frequency...



From time to time **ZERO** has to be pushed shortly to recall the audio threshold setting during operation.

When a search coil has been exchanged, the unit has been turned off, or the automatic two steps Ground Balance (steps 4 and 5) has not been activated a **PRE SET** Ground balance corresponding to the various coils and standard magnetic soil conditions will be always active in the **GND** modes! During operation the automatic Ground Balance can be performed from time to time on the ground at different places or on single magnetic stones.

Functions/ settings

- **DEL 1-4** All metals and ground mineralization will be indicated in this **DELAY** mode. 1 and 2 indicate large metal objects only while 3 and 4 will also provide a good sensitivity range for small coins/ foils.
  - **GND 1-4** All metals are indicated while mineralized soils are eliminated in this **GROUND** mode. Setting 3 and 4 provide the highest sensitivity range while ignoring the ground.
  - GND1** High conductivity objects (bigger nuggets and coins)
  - GND2** Low conductivity objects (small nuggets, foils)
  - GND3** Low and high conductivity objects
  - GND4** High sensitivity mode for all metals but only for use with double D coils on low/ medium mineralized soils. For highly mineralized soils refer to **GND1,2,3**
- The higher the **DELAY** or **GROUND** settings are, the more

sensitive the Z1 will respond to metals. Sometimes it is advisable to start in **DELAY** settings just to figure out how much ground minerals are present.

It is possible to choose either from the **DEL (DELAY)** or **GND (GROUND)** settings. It is not possible to activate both functions at the same time.

- **FILTER** reduces the amount of interferences produced by power lines radio transmitters, 0 gives a very fast response speed but no filter at all and 5 will offer a low interference but slow response speed. Use low settings with small coils and higher settings with large coils. Before using a higher Filter setting adjust the **FREQ (FREQUENCY)** first, in order to reduce the amount of interference.
- **AUTO** in position 5 the detector will automatically retune the audio threshold to changing ground or temperature conditions quickly. In position 1 the detector very slowly adjusts itself and in position 0 this automatic tuning is off which is recommended especially with large coils to achieve high detection ranges. In some cases at position 0 the **ZERO** control has to be pressed more frequently to achieve an audio threshold.
- **SENS** sensitivity adjustment setting: 1 low and 5 high sensitivity

- **VOLUME** settings: 0 no audio and 9 very loud
- **DLOG 1** turns on the built in data logger function in order to collect field data to produce color maps with the optional Hardware/Software kit
- **FREQ** Operating Frequency can be altered to any position in order to provide steady audio sound when electro-magnetic interferences from power lines or radio transmitters are present
- **AUDIO** the initial ticking rate or threshold sound can be

adjusted from -9 no sound to +9 slow ticking/ weak threshold sound. In most cases it is left in 0 mid- position in order to have a very weak audio sound even when no metal is located.

- **LIGHT** the backlight of the LCD can be altered from 0 off to 9 bright
- **TONE**
- 1** provides a **VCO** ticking sound with increasing frequency for all metals (useful with frame coils in the **DELAY** modes)
- 2** increases volume and frequency simultaneously for all metals (works well in all **DELAY** or **GROUND** modes)
- 3** will give a high sound for small non-ferrous metals like many gold Nuggets and a low sound with bigger non-ferrous and ferrous metal objects (only in **GND 1,2,3** mode). In **GND 4** or all **DELAY** modes a low sound will appear for all metals.
- 4** provides a low sound with ferrous and high sound for non-ferrous or large (hand sized or bigger) ferrous metal objects (operates with DD- coils only)
- 5** three tone motion ID gives a low sound for ferrous and a high sound for non ferrous metal objects. Weak indications or small, low conductivity objects will give a medium beep sound (operates with DD-coils only)

## 3.1 Other indicators on LCD

Above the function icons there is an intensity bar graph, a battery indicator, a **Ferrous/ NON-Ferrous icon** (works with double D coil only) and a conductivity number for the time duration of the eddy currents produced in a metal object, possible examples:

000-035 low conductivity like small coins nuggets foils

040-060 medium conductivity like ferrous metal objects

065-099 high conductivity like large non-ferrous metal objects made of copper, brass, silver for example.

Possible settings for small coils (26cm to 45cm diameter)

Nuggets/ Coins/ Relics

• Nuggets/ High mineral: **GND 2 or 3, FILTER 1, AUTO 0, SENS 4, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 3**

• Coin/ Relic single coil: **GND 2 or 3, FILTER 1, AUTO 0- 2, SENS 4, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 2 or 3**

• Coin/ Relic double D coil: **GND 3 (high mineral) or 4 (low mineral), FILTER 1, AUTO 0- 2, SENS 4, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 2 or 4 or 5**

Possible settings for large frame coils (1m x 1m to 3m x 3m) Cache/ Relics

• Low/ Medium mineral: **DEL 3 or 4, Filter 2, AUTO 0, SENS 4, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 1**

• High mineral: **GND 2 or 3, FILTER 3, AUTO 0, SENS 4, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 1 or 3**

## 3.2 Data Logger function DLOG

In order to generate color maps with the DEEPMAX Z1 an additional hardware/ software kit and a computer is necessary.

To start the data logger and collect field data proceed as described in chapter 3 and go on as follows:

**1.** Mark a field in the four corners and start in the left corner X/Y with a frame coil 1m x 1m in size for example

**2.** Turn on the **DLOG** function with 1. In this mode only a few functions can be altered or displayed. **All the other functions are locked with a preset P and the operator should not pay any attention to them**

**3.** Keep the coil at the left starting point and press **ZERO** shortly and immediately start to walk the first track while keeping the coil at constant height over the ground.

**4.** Press **ZERO** at the end of the first track. The duration of one track should be longer than four seconds! A complete field must consist of at least two or more tracks

**5.** Turn around 180 degrees and start the next track backwards for example 1m next to the first one pressing **ZERO** to start

**6.** In order to delete the last track press **ZERO** for a longer duration and repeat the same track again

**7.** Stop the last track with **ZERO** and store the same as a new field while pressing **POWER** shortly.

**8.** Leave the DEEPMAX Z1 on and connect the USB data transfer cable to the DEEPMAX Z1 and read the data with your computer and installed Surfer and Lorenz Data Converter Software

**9.** Compare the six different color maps generated with Surfer to distinguish between different kinds of metals, objects sizes, orientation and ground minerals.

In addition there are different indication icons above the number and in the middle of the display to make the operation of the data logger even simpler as follows:

• **M** Meter displays the meters already passed in the first track and counts backwards in the following tracks to zero in order to find the starting and finishing line of each track.

• **TR** Track indicates the currently active track and the amount of tracks already being stored.

• **FI** Field indicates the field currently in use and jumps to a higher number when storing the last track with the Power button shortly.

• **HDG** Heading information of the compass function to display the direction of the tracks.

*While being in the process of recording field data it is possible to press MENU in order to choose between Meter, Track, Field and Heading information on the display*

• **+/-180°** comes on when walking backwards a track in order to show that this amount of degrees has to be added or deducted from the displayed Heading to achieve the compass heading.

• **GPS** has to come on when a GPS is connected and DLOG is 1 (on) and starts to flash when no accurate GPS data can be received. The Z1 will work without GPS as well but does not provide the compass heading and meter function in this case.

• **Data logger** operation icon comes on when DLOG is on.

• **Bar graph dot** for compass heading information shows the operator how to go in straight line each track. For example the operator has to go to the left when the dot goes to the left or to the right when the dot drifts to the right. This has to be performed as long until the dot comes back to the middle. The operator will notice some delay until this indication reacts. It is absolutely necessary that the operator walks to make a valid GPS indication possible.

Therefore at least ten meters should be passed until the indicated GPS data is tolerable accurate. For further information on how to analyze field data please refer to chapter 14. All mentioned functions, settings, specifications and indication examples subject to change without notice.

• **USB** icon comes on when USB data transfer cable is connected with the computer and flashes when data transfer is in process.

## 4. Indicators/front panel LCD

### 000-099 Conductivity/ Time delay reading

The Number for the time delay measurement will come on when certain intensity is reached and stays on as long as the coil is over the metal. A time delay reading which is mainly derived from the conductivity, permeability and the object's size is displayed with a specific number on the LC Display. Possible examples: (000-035 coin or piece of foil, 040-060 iron, 065-099 large copper or silver objects). Any metal object detected will give a specific number (000 to 099). Therefore a certain intensity of the metal signal is necessary for a time delay reading. The number simply appears when a reading was possible. The indication will be stored as long as the search coil is over the metal and turns off when the search coil passes the same.

**FERROUS / NON-FERROUS icons**

This function does only work with the 26cm or 35cm double D coil. Ferrous metal objects like iron for example produce a FE indication at the top of the display and Non-ferrous metal objects like gold silver or copper will result in a NON- FE icon indication when the search coil is over the metal. The two icons will turn off if no metal is present or no double D coil is connected. This identification facility is tuned to the ground with the automatic ground balance as well.

**INTENSITY / signal intensity bar graph icons**

The signal strength will be indicated by the way of a large bar graph in the middle of the LC Display and an audio response from the speaker or headphones.

**GPS, USB icons**

These icons will work together with the built-in data logger function. For further information please refer to the instructions for use the LORENZ DEEPMAX Z1, data logger, Surfer and Scripser Software chapter 3.2

**BATTERY icon**

The battery condition will be displayed on the bar graph with 5 bars located on the top of the display. Note: The battery condition should be checked with a search coil connected and after a few minutes of operation.

**BATTERY alarm LOW BAT**

Low battery condition will be indicated by a pulsed beep sound every few seconds. The LORENZ DEEPMAX Z1 will turn OFF automatically a short time after this sound appears to avoid damage from the batteries. The pulse circuit is automatically turned off at low battery for safety reasons.



## 5. Connectors

**BATTERY jack**

This jack is located on the side of the control housing. The plug of the supplied battery pack has to be connected with this three way jack. The operation time of the LORENZ DEEPMAX Z1 on a fully charged battery pack at normal temperature range is approximately 5 to 10 hours depending on the coil connected.

**HEADPHONE- jack**

The supplied stereo headphones can be connected to this jack. Headphones with coded 4 way plug should be used from the manufacturer. The built- in loudspeaker will be automatically turned off when headphones are connected.

**Loudspeaker**

The LORENZ DEEPMAX Z1 has got a built-in loud-speaker on the front which gives an audible signal when the search coil approaches a metal object. The audio frequency and volume intensity will change with the distance between the search coil and metal for better pinpointing. Especially with two persons operation and large diameter coils the signal from the loudspeaker is of great help for both persons.

**GPS Module / data transfer jack**

The LORENZ DEEPMAX Z1 has a built-in data logger. In order to support the same with positioning data a GPS Module can be connected to this five way jack. An optional Data Logger Hard and Software kit would be necessary doing this. After collecting field data the same can be transferred via the same connection to the computer with an USB data transfer cable using the same jack.

**COIL jack**

Search coils of different size and shape can be connected to this jack. The search coils available for the LORENZ DEEPMAX Z1 have got coded connectors to adapt the electronics to the coil automatically. To connect a coil plug to the electronics make sure that it is fully pushed in the jack and that the sleeve is fastened by rotating it clockwise. Note: Any connectors should be disconnected when planning to store the equipment.

## 6. Operating procedures

Do connect the two shoulder straps to the main belt at both sides in the front and one large strap above the battery pack on the back. Adjust all the belts to comfortable length and fasten the main electronics unit in front of the operator. Connect the search coil-connector to the COIL jack on the right hand side of the electronics unit, and fasten the plastic sleeve of the connector by rotating it clockwise. Do connect the battery connector to the BATTERY jack which is located on the left side of the detector by pushing it gently.

Hold the connected search coil horizontally and far away from metal objects about one meter above the ground. Set the POWER button to turn the LORENZ DEEPMAX Z1 on. Press again for a longer duration in order to turn "OFF". At switch ON the detector runs through a display check sequence since all the icons com on and indicate the retuning process is performed by the electronics at the same time. If the BAT icon displays less than one bar afterwards or if the BATTERY alarm gives a beep sound every few seconds, the detector should be turned off again and the battery should immediately be recharged with the supplied charger. The battery condition is displayed with five bars on the top of the Display continuously during operation.

Afterwards the Detector will automatically turn to the positions which were selected the last time the detector was in use. While pushing the **ZERO, MENU, POWER** push buttons different settings will be selected and will be displayed on the bottom of the LC Display at the same time. See chapter 3 for details.

During operation no metal buckles or shoes containing metal parts should be worn. The same with keys, coins, rings and watches. Every metal carried by the operator can cause false signals, especially when they are located near the field of the search coil. Therefore the electronics control box has to be carried far away from the search coil, this is especially



important while searching with the large frame mounted coils but also with the smaller coils. Never use any metal screws when building frames for the cable coils. The loudspeaker will give a ticking or threshold sound after having retuned the detector correctly with the **ZERO** control. The sound can be individually tuned from silent to a low frequency threshold tone with the **AUDIO** settings. This pre-set audio tone will be recalled every time the **ZERO** control is pushed. This has to be done during the first minutes of operation due to warming up.

As the LORENZ DEEPMAX Z1 offers highest sensitivity with correctly tuned electronics, one should check the threshold tone from time to time during operation. Although a constant ticking sound is not always achievable, a threshold tone will give the operator the information that the detector works with its highest sensitivity.

Especially for metal classification and ground balancing purposes the electronics need to be tuned for best results (see chapter 3).

The detector is now ready for use and will indicate a metal object immediately with an audio sound emitted by the way of loudspeaker or headphones. The audio frequency will rapidly rise and attains its highest frequency when the search coil is directly over the metal. The centre of the search coil is the part with the highest sensitivity. Even in the direct near of the metal frequency changes make pinpointing possible in some tone modes.

When changing the search coil the electronics need always to be retuned via the **ZERO** control shortly. When lowering the search coil to the ground an audio sound may appear, this can be canceled out by pressing the **ZERO** control again. The distance between the search coil and the ground has to be kept at a constant height when searching afterwards. When working with small search coils of up to 45cm diameter it is also possible to select the **AUTO** function with **AUTO** 1 for slow and 5 for very fast automatic tuning in order to retune the electronics to changing ground conditions automatically during operation. The search coil therefore has to be moved at constant speed to achieve a signal from metal objects. When resting the coil over the metal the **AUTO** function will cancel out the signal after a certain time.

In the **DEL** modes large diameter coils like the frame mounted cable coils should be held at heights of (10 to 60 cm) over the ground to ignore magnetic mineralized ground or small unwanted metal objects. Those coils should be moved slowly without any up and down movements, parallel to the ground and at constant height.

When many small unwanted bits and pieces and very strong wanted signals are expected at the same time it may be advisable to select a lower delay setting like **DEL** 3 or 2 for example.

In the **DEL** 2 mode and especially while using large diameter frame coils the sensitivity to very small objects decreases. This is in many cases desirable, although the general sensitivity will be less. The simplest way to ignore small metal objects is to increase the distance between the search coil and the ground. Simply raise the loop and it will still be possible to locate those deeper and bigger metal objects. Be always sure that there is a sufficient distance between the detector or battery and the frame coil when raising the loop.

**Note: The LORENZ DEEPMAX Z1 metal detector has to be retuned with the ZERO control every time a different coil has been connected. During operation only a few**

**threshold corrections are necessary.**

**DEL 4, GND 2, 3, 4** with DD coil offers the greatest sensitivity especially for very small non-ferrous metal objects like coins and nuggets. To record the conductivity (derived from the time delay of the eddy currents produced by the metal objects) or to distinguish between a ferrous and non-ferrous metal please refer to the next chapter.

## 7. Identifying metal objects

This chapter is a summary how to proceed with the LORENZ DEEPMAX Z1, when locating metal, while using the two metal classifications, intensity reading and the audio signal. It is therefore in some cases possible to predetermine the exact position, the probable detection depth as well as the kind of metal located. A specially developed electronic circuit makes time delay readings possible which are directly displayed on a scale of 000 to 099. Those so called conductivity readings are only known from VLF TR- Machines but not from metal detectors based on the Pulse-GBS principle. In general these readings are based on object's size, conductivity and permeability of the metal and therefore named time delay readings for simplicity.

Please proceed as described in chapter 3 and 4 and follow these additional instructions listed below.

When lowering the search coil to the ground an increasing ticking-rate of the audio can be audible in some cases, especially when **DEL 1, 2, 3, 4** is selected.

This can either be generated by a metal object or mineralized ground. When expecting mineralized grounds with high iron oxide content the search coil can simply be raised again, (10 to 50 cm) depending on the coil and the LORENZ DEEPMAX Z1 can simply be tuned to the ground conditions while holding the coil at a constant height and pressing the **ZERO** button shortly. Pay special attention to metal objects in the near of the search coil which may cause false signals and therefore a false retuning process.

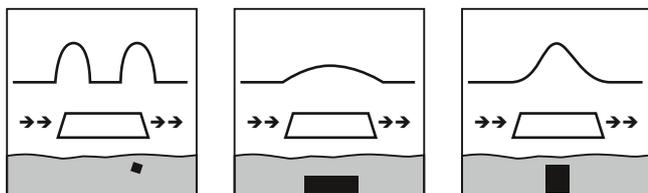
The search coil should be held at a constant height while searching. In many cases it is advisable to search in a systematic manner with a certain grid which can be marked on the ground for example.

The small (26cm; 35cm; 45cm) diameter search coils can be supplied with a telescopic S- pole which is held at constant height and in parallel to the ground. The coils have to be moved from side to side with overlapping tracks to detect even the smallest metal pieces which can sometimes only be detected in the centre of the search coil as this is the most sensitive part. Although the response speed of the LORENZ DEEPMAX Z1 is very high, the search speed should not exceed 2 meters per second.

When a metal object is located try to find the place with the strongest signal which means highest indication on the **INTENSITY** bar graph and highest audio frequency. Size, shape and depth information can be derived from the audio sound in some cases with some experience. Small objects like single coins will be indicated with a short and intensive signal when a small coil is used.

Coins and nails and very small pieces of metal will cause

two indications when passing them with a frame mounted search coil (1 m x 1 m) for example. This is mainly because those small objects are out of the range of the large coils



small object at the surface

large object buried deep

medium size object

and therefore will only be indicated at the edges of the frame coils and only when they are very close to it. Large metal objects will give an extensive signal with a longer duration, and therefore can easily be identified. Deeply buried metal objects will generate a weak and slowly increasing audio sound and intensity meter reading. Objects which are close to the surface generate a strong and rapidly increasing signal.

Large objects will cause a signal with a long duration especially when located with large frame mounted cable coils. For example a metal box 20cmx20cm can give a signal of up to 6 m in length when passing with a (2 m x 2 m) coil for example. It is therefore necessary to find the center of a buried object by the way of the audio and INTENSITY bar graph. This is achieved by moving the coil from different directions slowly towards the strongest indication. In many cases it is of great help to use an additional smaller coil when pinpointing a metal. The centre of the search coil is always the most sensitive part.

When having found the place with the strongest indication the time delay indication will come on with a number when the signal is strong enough. When double D coils are in use an additional FE ferrous / NON-FE non-ferrous indication will appear on the LC Display. Therefore the DEEPMAX Z1 has to be ground balanced first as shown in the chapter 3 or following chapter 8 to avoid false indications produced by the ground. Larger ferrous metal pieces will also be indicated as being non-ferrous.



## 8. Automatic Ground balancing GND 1/2/3/4

Ground signals which are mainly derived from magnetic iron oxides will be indicated with an increasing audio response when lowering the search coil to the ground although no metal is below the search coil. This kind of ground indication can be simply eliminated by simultaneously holding the search coil at constant height over the ground and pressing the **ZERO** push button for a second. As long as the coil is hold at the same height during searching there will be no loss in sensitivity. When expecting highly mineralized ground however it is always advisable to turn on the built- in ground balancing System (GBS) with the **GND** function turned on.

These different functions can be selected with **MENU** and **GND** flashing, in order to cancel out signals from magnetic soils or single stones with high iron oxide contents. Even some iron objects can be discriminated/ eliminated by the way of the same functions.

For automatic tuning purposes please go on as follows. Hold the search coil horizontally about 1m over the ground where there is no metal. Press the **ZERO** control for several seconds and wait until the first tuning process is finished in the air. Lower the coil to the ground and press the same **ZERO** control again for several seconds while keeping the coil close to the ground. When pressing the **ZERO** control the arrow on the display points up and down as long as the tuning proceeds. High and low beep sounds will indicate the same. During that time no movements of the coil should be done. Afterwards the detector is ready for use and there should be no or only weak indications of the ground when changing the distance between the coil and the soil in **GND1/2/3/4**.

During operation it might be necessary to retune the ground settings from time to time.

The LORENZ DEEPMAX Z1 should now be almost silent even

if the coil is raised in the air or lowered to the ground again. If still indications occur it may be possible that the Detector has been tuned to a piece of metal in the ground. In this case simply repeat the same procedure at a metal free place.

**GND 1** and **GND 2** could be selected at the same time to achieve highest sensitivity for most types of metal objects when **GND 3** is selected. The Detector will distinguish automatically between the

two signals and will use the stronger signal of the two. In most cases however the **GND 2** function will be sufficient. In the case of a connected DD coil **GND 4** will also be available. It is not necessary to run through the whole tuning process every time the ground properties changes but when changing the coil the ground compensation has to be tuned again. If changing ground conditions are expected the 35cm double D-coil and **GND 2** or **3** positions will be the best choice. When Double D coils are in use, the **GND 4** function works differently compared to the previous explained. The detection depth to many non-ferrous metal objects will significantly increase when **GND 4** is in use with that coil. In some cases however temperature changes might cause a drift of the audio and the detector therefore has to be retuned with the **ZERO** control from time to time or the **AUTO** function has to be selected to cope with this matter.

With turned on **GND** function the LORENZ DEEPMAX Z1 works with either reduced or higher sensitivity compared to **DEL** Delay functions. Some iron objects and very few non-ferrous metals with a similar signal response as iron will be indicated less sensitive. It is even possible to eliminate large or small iron objects when selecting a special **GND** setting like 1, 2 or 3. Signals will still occur when the distance between the coil and the metal is too small because of signal overload. However most metal objects will be



detected with almost the same or even higher sensitivity as without ground balancing circuit. An increase in interferences with turned on **GND** function due to power lines and radio transmitters will be realized. The amount of interferences could only be reduced by the way of changing search coils, setting the **FREQ** Frequency control to a different position, reducing the **AUDIO** threshold to -1, -2... or adding a higher **FILTER** setting with some expense of response speed.

## 9. Metal classification

In order to get further information from the buried metal object the metal classification can be used. The two metal classification features offered with the LORENZ DEEPMAX Z1 are based on different working principles. The calibrated metal classification will directly display the time delay reading 000-099 with all coils connected. This conductivity reading is very precise. It will be stored as long as the coil is over the metal and will disappear when passing the metal with the coil. The **FERROUS / NON-FERROUS** indication will only appear with the 26 cm or 35cm double D coil connected. Weak signals which are out of the range of the metal classifications can't be identified. When having located a metal object proceed as described in the following steps:

- Move the search coil from the side at constant height towards the located metal. Try to find the centre of the metal object with the audio signal. As soon as a certain intensity of the audible signal is reached a time delay reading will be performed by the LORENZ DEEPMAX Z1 automatically. This will be indicated with a number between 000 and 099 on the screen.
- Compare the displayed number with the following table. Therefore the search coil has to be held over the metal in order to store the conductivity value. For better accuracy the conductivity reading can be repeated. Therefore the coil has to be raised in the air or moved to the side until the first reading disappears. Afterwards the coil can be lowered to the ground towards the metal until another meter reading is performed by the LORENZ DEEPMAX Z1.

Conductivity reading	Possible metal object
0-10	coin, ring, ringpull, aluminium-foil, gold-coin
10-20	bronze-coins, silver-coins, nickel
20-30	soft drink-can, small pieces of iron
30-50	ferrous metal objects, nails
50-60	iron-box, bigger objects made of iron
60-80	medium sized bronze, copper, silver-objects
80-99	big bronze, copper, silver, aluminum, gold-objects

**Note: The conductivity indication can also be locked near 000 when very small coins, foils or gold nuggets are indicated. This metal classification will work in any position and with any search coil connected.**

**Note: Especially when expecting very strong signals and mineralized soils at the same time it is often advisable to hold the coil at a higher distance over the ground. This will help to ignore magnetic soils, because the coil is out of the range of the ground. This will increase the performance and accuracy of the classification circuit and makes it easier to locate and identify these metal objects. In most cases however a special circuit will suppress the false readings derived from magnetic soils effectively, even if the coil is close to the ground.**

When expecting very deep metal objects it will sometimes not be possible to perform a reading because the indication is always about 30 to 50 % less sensitive than the audio signal or the intensity bar graph.

Some smaller pieces of bronze may be indicated with a time delay reading between 50 and 60 namely the same as some ferrous metal objects. At the same time the LORENZ DEEPMAX Z1 does not suffer from anomalous effects like VLF-TR-sine wave detectors do. Therefore very big ferrous metal objects will not cause a higher reading than 60 in most cases. If ferrous and non-ferrous metal objects are simultaneously located by the search coil the metal classification circuitry will display the conductivity of the larger metal object on the screen. The reading may also lie between the two different kinds of metal.

The time delay/ conductivity metal classification of the LORENZ DEEPMAX Z1 will work with all available coils. It is capable to identify deeply buried big metal objects and small objects near the surface. It is often helpful to start with "in-air" tests in order to see how the detector responds to different metals. Highly mineralized soils, electromagnetic interference from power lines or transmitters can cause inaccurate conductivity meter readings especially in urban areas. Some nails or longer ferrous objects produce different signals when passing them with the coil.

Note: When expecting heavily mineralized soils it is necessary to tune the detector to the ground first as described before. The **FE/ NON FE**, Ferrous / Non-ferrous metal identification is of great help when classifying smaller objects in weakly or medium mineralized soils. With magnetic ground however this indication is less accurate and will only work with strong signals. The coil therefore has to be held at a constant height a few centimeters over the ground while passing the object from the side.

## 10. Search coils/accessories

Different search coils can be connected to the LORENZ DEEPMAX Z1 for special search and location purposes. In general small search coils offer great detection depths on small metal objects while large search coils offer the highest possible detection depths on big objects. The possible detection depths also depend on the setting of the detector, the kind of metal and the shape of the metal object and slightly on the type of ground below the search coil. The low sensitivity for small metal pieces in conjunction with the

very high sensitivity for bigger and deeper metal objects make the DEEPMAX Z1 especially useful when using it with large frame mounted search coils. The maximum detection depths achievable with a 1m x 1m frame mounted search coil are very high and can be increased when enlarging the search coil to 1,5m x 1,5m, 2m x 2m or 3m x 3m. Of course it will no longer be possible to detect single coins or nails with those large frame mounted search coils. In this chapter different search coils available with the LORENZ DEEPMAX Z1 are described. (Please refer to chapter 11 for detection depths)

### 26 cm search coil

This search coil was mainly developed for the location of very small metal objects like small nuggets or coin sized metal objects for example. The maximum detection depth is limited by the object size and the coil. In some cases it is easier to pinpoint very small metal fragments with this coil rather than with a double D- coil.

This search coil can be useful while pinpointing large metal objects which have been located with a frame mounted search coil before. Deeply buried metal objects can be out of the range of the small 26 cm search coil and therefore can only be detected with frame mounted search coils. The 26 cm search coil is waterproof and therefore can be used in saltwater for example.



### 26cm double D search coil

A special double D version of this coil with separate transmitting and receiving windings is also available. This coil makes FERROUS / NON-FERROUS indications on the display of the DEEPMAX Z1 possible.

Depending on the type of ground sometimes DD- coils are less affected by extremely mineralized soils but pinpointing will be more difficult than with a single loop coil.



### 35 cm - search coil

This highly sensitive search coil has got very good depth capabilities on single coins and medium sized objects. Nuggets smaller than 5mm in diameter should rather be detected with a 26cm search coil than with this coil due to poor sensitivity to very small metal bits and pieces. A telescopic pole with armrest is

necessary for any of the small search coils (26 / 35 / 45 cm).



### 35cm double D search coil

Separate transmitting and receiving windings offer more stable operation on soils with changing contents of iron oxides (minerals) in some cases. This coil can be used for most search applications. The FERROUS / NON-FERROUS metal identification does work with these 26cm and 35cm double D search coils.

**Note: The electrical properties of the double D search coils may change when mechanical tension is produced in the coil when being used not properly. Search coils therefore are not covered by warranty for that reason. The same with the connecting cable which should be fastened with the belt strap first before connecting to the electronics unit to protect the same and to avoid broken cables.**



### 45cm search coil

This search coil can be operated by a single person with the S-rod-handle. It offers extreme depth ranges on either single coins or bigger objects buried deep in the ground. Depth ranges of more than 1 m for a metal object of the size of a soft drink can (0,33 l) or up to 50cm on a single gold coin with 25mm diameter make this coil interesting for a lot of different search and locating purposes.

Those extreme depth ranges on medium sized and bigger metal objects make frame mounted search coils unnecessary in some cases. Small items can be eliminated by increasing the distance between the coil and the ground. This 45 cm coil covers much more ground than a 26cm coil does and therefore makes very effective searching possible.

Coins with a diameter of less than 15mm should rather be detected with smaller search coils.





### Universal cable coil 8 m perimeter

This extremely lightweight and easy to transport universal cable offers a variety of different search coils for different search applications. The cable coil has to be fixed with tape on a frame which can be made of PVC-tubes for example. The following search coil configurations are mainly useful for the location of metal objects with a surface of at least 6cm x 6cm or hand sized metal objects for example. Small metal pieces like single coins or nails will be indicated with poor sensitivity or will even be eliminated in some cases because they are out of the range of these frame coils. It is very easy to cover a large area with frame coils in a short time. This is especially useful when looking for bigger deeply buried metal objects while ignoring those smaller metal pieces at the surface.

The following frame mounted search coils have to be carried by two persons with adjustable carrying straps. The search coil should be held in parallel to the ground at a constant distance of 10 to 60 cm. The electronics control box should always be carried far away from the field of the search coil. It is also necessary not to wear any clothes, belts or shoes with metal when operating the LORENZ DEEPMAX Z1 to avoid false signals.

### 0,67 m x 0,67 m (3 windings) universal cable coil 8 m perimeter

The 8m universal cable coil has to be arranged to a 3 winding search coil and has to be fixed on a 0,67m x 0,67m frame made of PVC-tubes for example.

Never use any metal screws for the construction of a frame! This is the smallest frame mounted search coil which offers extreme detection depths for smaller and medium sized objects. Metal fragments and some coins will still be indicated. The maximum detection depth is limited below the bigger frames but higher than with a 45cm diameter coil.

### 1m x 1m (2 windings) universal cable coil 8 m perimeter

The universal cable coil has to be arranged to a 2 winding search coil and has to be fixed on a 1m x 1m PVC- tube frame for example.

Searching with the 1m x 1m frame coil is mainly advisable when looking for hand sized or bigger metal objects buried deep while ignoring small coins, nails and pieces of foil at the surface of the ground. The possible detection depths with this particular frame coil are very high compared with standard sine wave VLF-TR-detectors (see chapter 11). This is one of the reasons why this particular search coil is used for most professional applications. Large areas can be covered in a short time. Best results are achieved with metal objects having a surface of at least 10cm x 10cm. Because of the size of the coil most of the small metal fragments will be ignored. However bigger nails can be identified with the conductivi-

ty/ time delay metal identification. Most of the nails and other metal fragments can be easily eliminated by increasing the distance between the search coil and the ground. Even at distances of 50 cm or more there will only be negligible detection depth losses when locating large metal objects. This frame coil has to be carried by two persons with carrying straps.

The high depth range of the 1mx1m frame coil is achieved with intense and therefore deep going magnetic field transmitted. The detection depths listed in chapter 11 have been recorded with different **DEL** Delay and **GND** Ground settings. In some cases detection depths in wet, conducting ground are slightly higher or lower than listed.

For even higher detection depths use the 12m cable coil which can be arranged similarly to the 8m cable coil to 1m x 1m, 1,5m x 1,5m or 3m x 3m.



### 1m x 1m frame coil with cable inside tubes

This is a very user friendly 1m x 1m coil with the same electrical properties as the 8m universal cable coil with two windings as described before. The main advantage of this particular search coil is its simple assembly, which can be performed in a few steps. The disassembled coil is easy to transport and will always be ready for use.

The coil cable is protected inside the tubes and therefore can be used even under the worst environmental conditions. Two adjustable carrying straps are supplied with every frame coil.

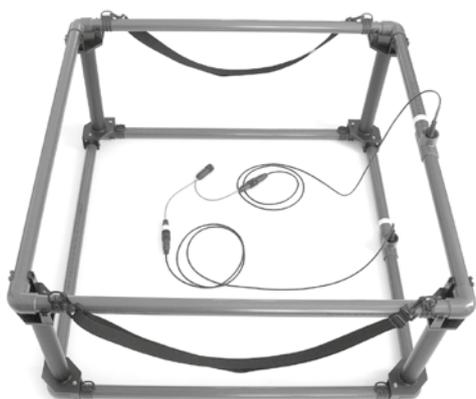
### 2m x 2m (1 winding) universal cable coil 8 m perimeter

The 8m universal cable coil has to be laid to a single turn on a metal free frame and has to be fixed with tape for example. This particular search coil covers four times as much ground as a 1m x 1m frame coil does. It should only be used when searching for metal objects with a surface of at least 20cm x 20cm pointing towards the coil. Smaller metal objects will be located less effectively than with a 1m x 1m frame. This is mainly because it will become more difficult to pinpoint those smaller objects with the large coil. The maximum detection depth is very high and can only be increased with the 12m cable coil arranged to a 1,5m x 1,5m or 3m x 3m frame. The 2 m x 2 m frame coil can be carried by two persons without any carrying straps at a distance of about 80cm above the ground. This is particularly useful when trying to ignore medium sized metal objects which are smaller than a horseshoe for example. Coins and nails will no longer be detected when doing this.

The 2m x 2m coil acts as a large aerial for medium wave transmitters. Therefore smaller frames like the 1m x 1m coil will be of better choice when working in urban areas. The next coil described will be less sensitive in general but won't suffer from electromagnetic interference of transmitters or power lines.

### 1m x 2m compensated coil (two separate windings) universal cable coil 8 m perimeter

In order to construct this compensated coil the 8m coil cable has to be laid to the figure of the shape of an eight (8) first. The coil cable has to be fixed on a 1m x 2m frame with a center part which divides the frame into two 1m x 1m frames. The cable has to be laid and fixed twice on the centre part as this is the middle of the eight (8). This type of frame mounted search coil is about 30% less sensitive than a 1m x 1m search coil. This is because of the opposite directions of the transmitted magnetic field. During the receiving phase the two windings of the eight do also work in opposite. Therefore interference and some ground indications are subtracted from each other and therefore eliminated. Interference from radio transmitters or power lines will be almost completely cancelled. This compensated 1m x 2m frame mounted search coil is of great advantage when locating metal objects in urban areas where interferences are often expected. This type of coil has a very poor sensitivity for small metal objects. The minimum surface of a metal plate should be 10cm x 10cm to ensure good results when working with this coil. The LORENZ DEEPMAX Z1 will work very stable with this particular coil. The following described 1m x 1m double frame coil will give much higher detection depths namely almost the same sensitivity range as a single 1m x 1m frame but is also capable to cancel out said EMI (electromagnetic interferences).



### 1m x 1m double frame coil kit

This specially designed double frame coil kit basically consists of two 1m x 1m frame coils mounted on each other at a distance of approximately 60 cm. Because of its ability to cancel out interferences from power lines or radio transmitters it can be used in urban areas where single loop coils will suffer from false signals and poor sensitivity when electromagnetic interferences are present.

The two coils receive the same amount of interference but work in opposite directions. Therefore almost any interference is subtracted from each other while signals from the ground or metal objects will pass to the electronics. It is important that the components of the double frame kit are put together in the right order as described below. The available kit consists of the following components: two 1m x 1m frame coils; four black mounting devices 0,6m length; one Y adapter cable with three connectors; two carrying straps.

The two 1m x 1m frames have to be mounted on each other via the four mounting devices. They will automatically lock when pressing them together.

Please make sure that both frames go in the same direction, so that the two yellow marks are pointing to each other the same way! Afterwards the marked Y adapter plug has to be connected to the lower frame which points to the ground. The second frame has to be connected to the other adapter

plug. The third connector has to be connected to the electronics control box.

**Note: It is advisable to make an operating test where the lower search coil pointing to the ground gives a signal when approaching a metal piece located on the ground and the upper coil will cause a decay of the signal when a metal piece is approaching from the top towards the coil. This could only be tested with DEL Delay settings and turned off AUTO 0.**

The sensitivity of this double frame coil is almost the same as with the 1m x 1m single loop frame coil. This coil does only suffer from a very weak sensitivity reduction of less than 10 % for very deep and large metal objects. Especially when working in the **GND** Ground mode it is very useful to work with this particular search coil due to very stable and therefore sensitive operation.



### Cable coil

#### 12 meters perimeter 1m x 1m (three windings), 1,5m x 1,5m (two windings) or 3m x 3m (one winding)

Similar to the 8m universal cable coil this large cable coil can be arranged to three different frame coils by simply mounting one two or three windings on a metal free frame with tape for example. With the largest 3m x 3m frame coil the highest possible detection depths can be achieved. This is mainly possible because of specially developed electronics to eliminate low frequency interference and a power pulse circuit built-in the LORENZ DEEPMAX Z1. The high sensitivity for large and deeply buried metal objects and the simple elimination of smaller metal fragments make these three coils interesting. The shape of these large coils should be the same as with the other coils namely round or square. It is also possible to build elliptical or different shapes but this is only achieved at the expense of sensitivity. Anyway it is advisable to keep a distance of at least 20 to 80 cm constantly between the coil and the ground to reduce the amount of ground effects to a minimum when using these very large coils. In urban areas the amount of interferences produced from power lines will be higher than with smaller coils and therefore again the sensitivity might be reduced. The ground balancing system **GND 1, 2, 3** should be changed to **DEL 1-4** in some cases using these large coils because of the same reason. Some customers use these large frame coils with two similar coils mounted on each other at a distance of about 60

to 80 cm the same way as the differential double frame coil described before. A Y-adapter cable would be necessary doing this. A test making sure that both coils work in the same direction as described before would also be necessary.



## 11. Detection depths I

Used Searchcoil Metal object	26cm- coil	35cm DD-coil	35cm- DD-coil GND4*	45cm- coil	1m double frame square	1,5m double frame square
Gold nugget d = 5 mm	22 cm	23 cm	28 cm	(30 cm) X	X	X
Silver coin d = 1,3 cm	30 cm	30 cm	34 cm	(30 cm) X	X	X
Gold coin d = 2 cm	40 cm	40 cm	45 cm	50 cm	(50 cm) X	X
Silver coin d = 2,5 cm	45 cm	46 cm	50 cm	55 cm	(50 cm) X	X
Brass plate 10 x 10 cm	80 cm	90 cm	100 cm	110 cm	145 cm	170 cm
Softdrink can 0,33 l	100 cm	110 cm	120 cm	130 cm	165 cm	200 cm
Brass plate 20 x 20 cm	105 cm	118 cm	130 cm	125 cm	185 cm	240 cm
iron box 30x18x15 cm	150 cm	160 cm	170 cm	200 cm	280 cm	340 cm
Fuel tank 20 l	160 cm	175 cm	185 cm	210 cm	300 cm	380 cm

Detection depths recorded in medium air; Function: **DELAY 4 / \*GND 4**

X = outside the range of the coil.

### 11.1. Detection depths II

Used Searchcoil Metal object	26cm- coil	35cm DD-coil	45cm- coil	1m double frame square	1,5m double frame square
Gold nugget d = 5 mm	15 cm	15 cm	X	X	X
Silver coin d = 1,3 cm	22 cm	22 cm	(20 cm) X	X	X
Gold coin d = 2 cm	29 cm	33 cm	31 cm	X	X
Silver coin d = 2,5 cm	35 cm	40 cm	42 cm	X	X
Brass plate 10 x 10 cm	75 cm	85 cm	95 cm	135 cm	160 cm
Softdrink can 0,33 l	80 cm	90 cm	100 cm	130 cm	160 cm
Brass plate 20 x 20 cm	100 cm	110 cm	125 cm	180 cm	230 cm
iron box 30x18x15 cm	130 cm	145 cm	165 cm	240 cm	320 cm
Fuel tank 20 l	150 cm	165 cm	190 cm	280 cm	370 cm

Detection depths recorded in medium air; Function: **DELAY 3**

X = outside the range of the coil.

## 12. Battery / charger

The LORENZ DEEPMAX Z1 is supplied with an external rechargeable battery which will power the electronics 5 to 10 hours depending on the coil connected and the environmental temperature conditions. The usage time will be 8 hours under average conditions.

A discharged battery should be recharged with the supplied charger. Therefore the plug of the charger has to be connected to the plug of the external battery pack and the AC-plug of the charger to the mains. The charge electronics will automatically change to a trickle charge mode or turns off when the battery is full. The battery is therefore protected and can't be overcharged.

Yellow = charging

Green = trickle charging/charge complete

The maximum recharge time is limited at approx. 8 hours on an empty battery depending on ambient temp. and Battery condition. The rechargeable battery pack can be recharged at any time even if it is only used for a few minutes and the capacity is still very high. The Battery is protected and can't be overcharged.

The detector will automatically turn off when the battery is low for safety reasons. When trying to turn on the detector with low battery the display shows LOW BAT and turns off automatically.

The following safety information must be read before using the charger supplied with every DEEPMAX Z1 detector:

- Please read the user instructions before using the charger
- For indoor use only (protect against moisture)
- Never try to charge ordinary non-rechargeable batteries!
- Do only use to recharge 12V/ 7-8Ah NiMH battery available from the manufacturer of the LORENZ DEEPMAX Z1
- Rechargeable batteries supplied with the LORENZ DEEPMAX Z1 contain chemical substances they are subject to special waste disposal.

Charger Input data: UE = 90-264 V AC / 50-60 Hz

When disconnecting the charger from the mains it is important to disconnect the plug from the battery pack as well to avoid a slow discharge of the batteries. The supplied charger has got a wide range of input voltages in order to fit with any country mains. Different AC connectors are available on request only. There are no specific transport obligations for land maritime or air, this battery/ charge system is therefore designed for worldwide operation.

### Battery transportation information

All of our lead acid batteries are unregulated by DOT for transportation by truck, rail, ocean and air transportation because they meet the requirements of 49 CFR 173.159 (d). The only transportation requirements are:

- The battery must be securely packaged in such a way to prevent the possibility of short-circuiting.
- The battery and the outer most packaging must be labeled »NONSPILLABLE«

All of our lead acid batteries are unregulated for air transportation because they meet the requirements of Special

Provision – »A67« as promulgated by the International Air Transportation Association (IATA) and the International Civil Aviation Organization (ICAO)

**Note: Only spare parts and accessories available from the manufacturer of the LORENZ DEEPMAX Z1 should be used.**

To guarantee a long lifetime of the battery pack it should never be completely discharged, as this can result in a loss of capacity or complete damage of the battery.

**Note: Do never forget to turn off the LORENZ DEEPMAX Z1 when it is not in use or when planning to store it. Disconnect all plugs from the control box when transporting or storing it.**

The capacity of the battery can always be checked when turning the LORENZ DEEPMAX Z1 on with the Battery icon on the top of the LC Display. If it is lower than 2 bars the battery is nearly empty and less than 1 hour usage time can be expected. Recharging of low batteries would be essential. Resulting damages of low discharged batteries can't be covered by warranty.

The life time of the supplied battery pack is limited to five years. After this period of time the capacity of the battery will constantly decrease, which makes an exchange necessary.

**Note: Please make sure that the connector of the rechargeable battery is always kept dry and clean and that no conducting material is in the near of the connector when storing it. It is always necessary to take special precautions of avoiding short circuits when handling with batteries!**



## 13. Interference

The LORENZ DEEPMAX Z1 was developed to ignore most electromagnetic interference EMI received by the search coil. In some cases however there are very strong interferences produced by power lines, railroad tracks or transmitters which are very difficult to suppress with electronic circuitry as they are many times more intense than a signal received from a metal object for example. Several filter circuits have been added to the LORENZ DEEPMAX Z1 to suppress most low frequency interference. Especially in the near of power lines interference can be noticed with false signals or rhythmic signals which cause indications on the screen or an audio response.

In urban areas, near transmitters or when other metal detectors are working close to the DEEPMAX Z1 interferences could also be expected. In general interference will increase with the size of the search coil. Interference received with large coils is often accepted in respect of the high sensitivity still offered with those particular coils. In some cases interference can be so intense that it is simply impossible to work with the DEEPMAX Z1. Therefore it will sometimes be necessary to change the frequency **FREQ** to suppress some interference. The **FREQ** Frequency function can therefore be turned to a lower or higher setting, until the audio sound is clear and without any rhythmic pulses. The sensitivity or the metal classification will not be affected when doing this. For further reduction of any pulsed interferences put **FILTER** to a higher setting but this will also result in a slower response speed which makes only sense with frame coils but not with smaller coils.

If it is not possible to reduce interference by changing the frequency and filter of the LORENZ DEEPMAX Z1 it is either possible to put the **AUDIO** or **SENS** Sensitivity to a lower setting until the noise disappears. When setting the **AUDIO** setting to - the sensitivity of the LORENZ DEEPMAX Z1 will be slightly reduced, but the amount of false signals will also be greatly reduced. When connecting a smaller search coil the amount of interference can also be reduced. The compensated 1m x 2m frame mounted search coil or the double frame coil do not suffer from interferences, false indications are simply reduced when using these coils. This will always guarantee a very stable operation of the LORENZ DEEPMAX Z1. For the detection of smaller objects the available 1m x 1m double frame coil should be rather used than the compensated 2m x 1m (eight 8 shaped) coil. This specially designed frame coil is capable to eliminate interference while offering detection depths similar to a single loop 1m x 1m frame coil. Especially when working in the **GND** mode this coil is the best choice, as the electronics need a signal free of interference to be able to cancel out the ground and to distinguish between different metals.

**Note: Low interference with clear audio response and correctly tuned (zeroed) electronics is absolutely necessary to make exact metal classifications and ground excluding functions possible. The LORENZ DEEPMAX Z1 has to be tuned and the right coil has to be chosen first before starting to identify metal objects.**

The electronics unit of the LORENZ DEEPMAX Z1 does not suffer from any drift in general. That means only in case of

extreme temperature changes the electronics have to be retuned with the **ZERO** button shortly. The same should be done after the very first five minutes of operation since many components inside the LORENZ DEEPMAX Z1 control box need to warm up to their working temperature. When working with small handheld search coils the AUTO function can also be used to make the detector work more stable.

## 14. Data Logger/ analyzing field data

To generate color, image, surface or contour maps with the Lorenz DEEPMAX Z1, an additional data logger Hard- and Softwarekit is necessary. [To install the same please refer to the instructions enclosed with USB-stick. It will be necessary to install the Software package Surfer, the virtual Com Port Driver to connect the Z1 to an USB Port of your computer and the components »Lorenz Script«, »Lorenz Z1 Data logger utility«.](#) A very sophisticated data logger function of the DEEPMAX Z1 metal detector will take simultaneously multiple channels of data when you go over the ground and stores the information into memory when this function is selected (see chapter 3.2 for instructions).

After recording field data the Surfer Software easily and accurately transforms the stored data into color, contour, surface, image or vector maps on a computer in minutes. An additional Scriptor Software will therefore automatically generate twelve maps with each field. Six are two-dimensional and six three-dimensional. The operator can therefore choose between different gridding and mapping methods. The LORENZ DEEPMAX Z1 Data Logger Hard/Software kit developed by Lorenz Detecting Systems is first of all easy to use, very accurately working and affordable. Only three controls of the DEEPMAX Z1 will make data acquisition a pleasure for both beginners and professionals like engineers, geologists, archaeologists, scientists and many more. The users will investigate mainly for waste disposal, meteorites, or lost aircrafts.

No non- sense functions will confuse the operator. Six different maps will be generated simultaneously when covering the ground with multiple tracks. Each scan/ map is different depending on the electronic analysis method and therefore will not only give different sensitivity ranges but can be the key to the probable kind of metal buried in the ground. There is clearly a difference in the signature metal objects and ground conditions will give for example. Areas of disturbances in the scans will directly lead to the different metals or ground signals and therefore can be classified in some ways. The operator therefore can use the different scans to his advantage in order to choose between the metal objects of most interest only by comparing the different scans/ maps. Three delay channels will produce maps with different sensitivity to small and large metal objects. Two ground channels will enable the operator to generate maps with no ground response but Z dimensions. Ground compensation can be performed manually, automatically or with offered preset values on the computer easily. In addition the metal classification channel will display the delay of the eddy currents of each signal with a specific color to give further information on the probable kind of metal in the ground. No matter how strong the ground is mineralized or how many different metals are located in close proximity, this new device will ensure very good results even with difficult

surrounding conditions. Faults produced by the operator or the environmental conditions like overload signals from nearby metal objects for example will be immediately seen when comparing the different maps. In addition GPS data is also recorded from a supplied GPS module to support the user with a compass function or to find the different fields after recording again.

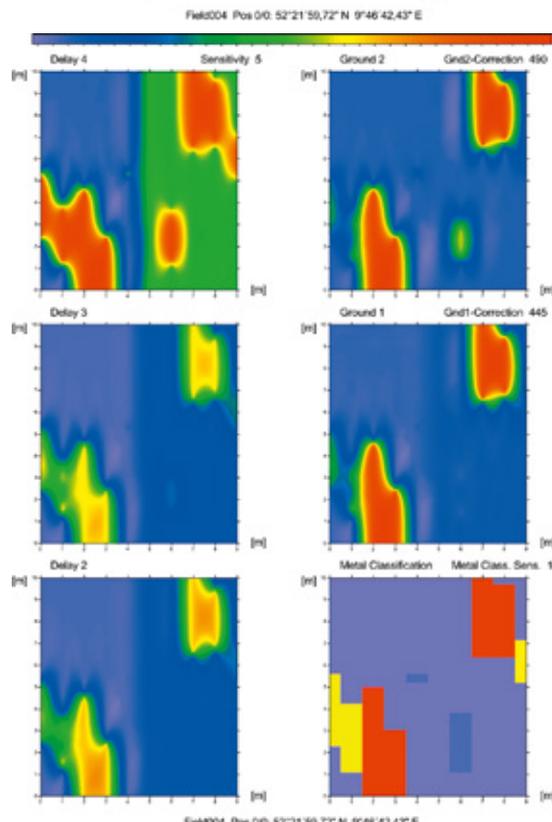
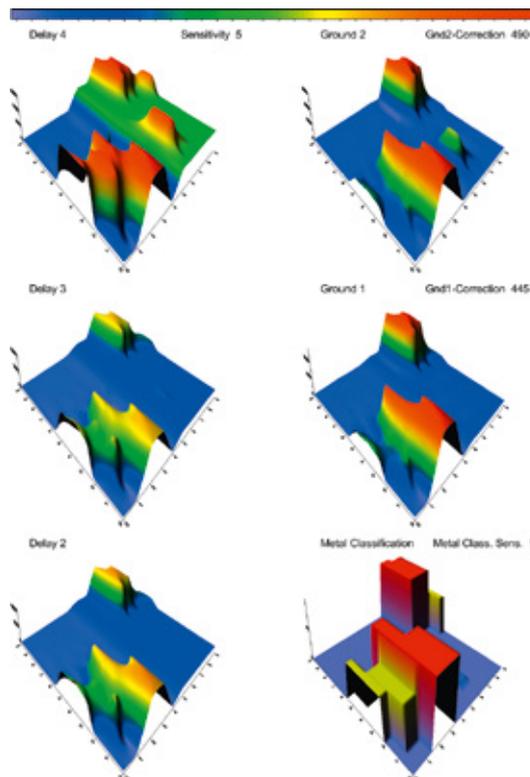
For the professional users additional Hard- and Software will be available for storing positioning data from GPS and several DEEPMAX Z1 detectors simultaneously.

Although the detector can be used with smaller search heads the data logger function is mainly developed for larger metal objects being at least 6cm x 6cm in size. Therefore frames of 1m x 1m or even bigger should be in use to achieve best results.

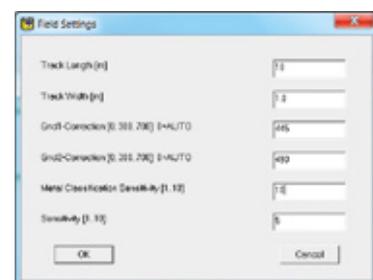
To analyze the different pictures generated with the software refer to the following instructions. Compared to many other systems the Lorenz DEEPMAX Z1 will not only generate one or several graphic representations with different sensitivity ranges for the same metal objects but also gives additional information on the probable kind of metal being located. The advantages of the multiple channel data logger are as follows:

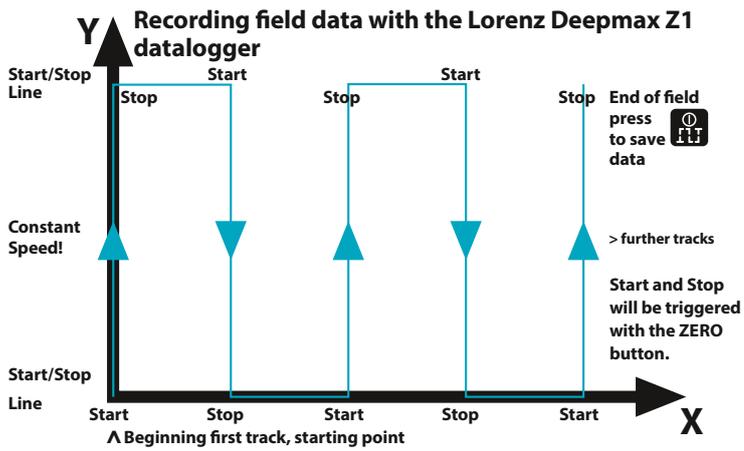
- False or overload data will be easily recognized on one or two of the maps. At the same time you will find useful data on at least one or two channels. When looking at the different maps/pictures select only these with no ground signals or with the stronger indications to avoid investigating on the small junk objects like foils, nails, magnetic soils or littered ground near the surface.

- Some signals appear on one scan and disappear on others to give the operator more advanced information on the kind of metal (decay of the eddy currents) or the surrounding ground conditions.
- It is possible to separate two or more different metal objects which give only one large indication in the Delay channels but two on the metal classification or Ground channels.
- Some ferrous metal objects lying horizontally in the ground will cause a special double or triple signal when looking at the Ground channels.
- When looking at the Ground channels most of the ground and some of the smaller ferrous items will no longer be displayed comparing them to the Delay channels.
- On the metal classification pictures stronger signals which generate a conductivity reading will produce mainly a single color dot corresponding to the delay reading on the display of the DEEPMAX Z1. Neutral ground will cause a purple indication. Different nearby metal objects lying in close proximity will give different colors in most cases for better selection. See table of metal classification indications with a 1m x 1m frame coil below:



Colour on metal classification channel	Reading on the Lorenz Deepmax Z1 without data logger (00-99)	Corresponding possible metal object
Purple	No Reading/ neutral	No metal or signal to weak
Blue	00 - 10	Thin foil non-ferrous
Green	15 - 40	Small ferrous nail
Yellow	45 - 60	Ferrous metal object
Orange	65 - 75	non-ferrous metal object
Red	80 - 99	Large non-ferrous metal object





## 15. Maintenance/service

The LORENZ DEEPMAX Z1 is practically service free. The electronics control box and the other components should always be kept clean and dry. This is particularly important for the plugs and sockets, which should never be stored when being wet. The electronics control box is water and dust protected but it should be avoided to immerse the unit in water. All search coils available for the LORENZ DEEPMAX Z1 are waterproof up to the connector. All the connectors should be kept dry.

The LORENZ DEEPMAX Z1 is ruggedly designed. All necessary electronic components are placed on two printed circuit boards. The main circuit board is covered with a special plastic to protect it from rapid temperature changes and humidity.

Different components like the front panel, circuit boards and connectors can easily be exchanged if necessary.

### Guarantee

This Detector is guaranteed against defects in materials and workmanship for two years within European Community and one year outside the EC, with the exception of batteries and accessories. The guarantee is not valid when disregarding following

- Non-observation of our guidelines in the operating instructions
- Use outside the described applications
- Alteration to or opening of the device
- Mechanical damage caused by media, liquids, natural wear and tear
- Electric installation
- Overloading of the detecting equipment

All of the components can be cleaned from dust with a soft cloth if necessary. In case of false signals or any kind of unstable operation please check the capacity of the battery the condition of the connectors and cables/ search coils first.

In the case of any false functions or problems occurring with your LORENZ DEEPMAX Z1 detector do contact your dealer where you have purchased your detector first before you contact us at:

**Lorenz Detecting Systems GmbH & Co. KG**  
**Röpkestrasse 12 · 30173 Hannover Germany**  
**Telephone: +49 (0)5 11 55 106 70**  
**Fax: +49 (0)5 11 55 106 71**  
**eMail: mail@metaldetectors.de**  
**Internet: www.metaldetectors.de**  
**www.deepmax.com**

## 16. LORENZ DEEPMAX Z1 equipment/accessories:

LORENZ DEEPMAX Z1 detector only (without coils)

- Plastic carrying case with foam padding
- LORENZ DEEPMAX Z1 electronics control box
- Adjustable shoulder and belt strap with detachable rechargeable battery pack
- Charger with wide range AC-input (90-264V)
- Euro AC- adapter

- USB adapter cable for data transfer
- Operating manual (English/ German)
- Stereo headphones with four way connector

LORENZ DEEPMAX Z1 Detecting kit includes in addition

- 1m x 1m frame coil with carrying straps
- Carrying bag for 1m x 1m frame coil
- Telescopic S pole, consisting of three rods
- 35cm DD- coil

LORENZ DEEPMAX Z1 Data Logger Hardware/Software kit

- Golden Software SURFER single license
  - GPS- Module
  - USB-Stick with Lorenz Data Converter Software
- This kit was made for use with the DEEPMAX Z1 built-in data logger function. To generate colour maps an additional computer with following system requirements would also be necessary, but not included with this kit: Windows XP SP2 or higher; Vista; 7; (Trade Mark of Microsoft), 1GB RAM, 100MB free hard disk space, 1024x768 or higher monitor resolution with a minimum 16-bit colour depth

## 17. Specifications weight/ dimensions:

Electronics control box: 120x122x85mm

Carrying case for LORENZ DEEPMAX Z1: 400x300x220mm

1m x 1m frame coil (collapsed): 1080x150x150mm

Extended S-rod length: 1550mm

Collapsed S-rod length: 1030mm

Disassembled S-rod length: 690mm

LORENZ DEEPMAX Z1 electronics control box:

approx. 1300 g

Shoulder and belt strap with mounted external battery

pack: approx. 3400 g

Carrying case with LORENZ DEEPMAX Z1 inside: approx. 7500 g

Telescopic S pole: approx. 600 g

26cm single coil: Weight approx. 500 g\*

26cm double D coil: Weight approx. 600 g\*

35cm single coil: Weight approx. 600 g\*

35cm double D coil: Weight approx. 800g\*

45cm single coil: Weight approx. 700 g\*

1m x 1m frame coil with cable inside tubes: Weight approx. 2600 g\*

Universal cable coil 8m perimeter (can be used for 0,7mx0,7m; 1mx1m; 2mx2m and compensated 1m x 2m frame mounted search coil): Weight approx. 600g\*

Universal cable coil 12m perimeter (can be used for 1mx1m; 1,5mx1,5m; 3mx3m frame mounted search coil): Weight approx. 900g\*

1mx1m double frame coil kit: Weight approx. 7300 g\*

Y-Adaptor cable: Weight approx. 100 g\*

\*all weights taken with connecting cable and connector!  
 The coils ranging from 26cm to 45cm diameter need a telescopic S pole for operation.

### Electrical data:

Search-frequency with small/large search coils connected:  
 approx. 2000 / 1000 pulses per second  
 Audio metal response voltage controlled oscillator VCO and volume/ threshold control: 0 - 4000 Hz

Power source: external rechargeable battery 12V/ 7-8Ah  
 Usage time: approx. 5 to 10 hours depending on temperature and connected coil  
 Battery charger: charger with 90-264V AC/ 50-60Hz for world-wide operation  
 Operating temperature: - 5°C to + 50°C  
 Detection depths: see chapter 11

**Data logger:**

multiple channel data acquisition, supported by GPS  
 Storage media: internal memory  
 Field length 100m maximum  
 Number of fields: 99  
 Sampling rate: 12 per second  
 Resolution: 24 bit

**GPS Module:**

Channels: 50 channels  
 Sensitivity -162 dBm  
 Frequency L1, 1575.42 MHz  
 C/A Code 1.023 MHz chip rate  
 Precisions: Position Horizontal 2.5m CEP, 2.0m SEP with SBAS  
 Date: WGS-84  
 Protocol: NMEA-0183 V3.01 GGA, GSA, GSV, RMC, VTG  
 Performance: Operating temperature: -20°C to +60°C  
 Dimensions: 65 x 45 x 22 mm

Search coils (interchangeable) electrostatic insulated/shielded and waterproof up to the connector. The connectors themselves are not waterproof!  
 Design and specifications subject to change without notice!

**Disposal Notice**

In accordance with directive 2002/96/EC of European Parliament and the council of January 27, 2003 on Waste Electrical and Electronic Equipment (WEEE), products labeled with the symbol of a crossed waste bin must not be disposed of with unsorted municipal waste. For this purpose please check for certain collecting points for electronics equipment.

