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LORENZ DEEPMAX.com Z2

USERS MANUAL

The following metal detector LORENZ DEEPMAX Z2 Correspond to the following EC requirements:

EC-EMC-directive version 89/336/EEC

The LORENZ DEEPMAX Z2 series are found to meet the specification requirements detailed, when tested to the customers/ specification requirements. Compatible norms are in particular:

Test Specifications & Categories

Emissions EN55032.2015
Immunity EN61000-6-1:2007

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

COMPLIANCE

FCC ID: 2AXXCDEEPMAXZ2

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved by Lorenz Detecting Systems GmbH & Co. KG could void the user's authority to operate the equipment.

CAN ICES-003(B) / NMB-003(B)

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INTRODUCTION

Our aim at Lorenz: to build a most compact and powerful metal detecting machine. The LORENZ DEEPMAX Z2 series detectors are some of the newest developments in the field of Pulse GBS metal detectors made in Germany. It is probably one of the most sensitive and stable metal detecting devices of its kind presently available. The LORENZ DEEPMAX Z2 is the result of many years of research and development. Worldwide many successful Deepmax users hold a complete new compact and rugged designed electronics device in their hands. An all new control housing with anodized aluminium machined from a single piece of aluminium, latest controllers and analog to digital converters are in use with this particular detector model. The detection range for natural gold and other non ferrous metal objects has been improved. A differential electromagnetic noise cancellation with new coil designs make this device very useful in areas where a lot of interferences from power lines are present. The complete transmitting and receiving circuitry was renewed in order to achieve even more stability and sensitivity.

The Pulse GBS (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. This model offers a great range on non-ferrous metal objects in general. The DEEPMAX Z2 is a reliable tool to locate 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. For this purpose a power PST (Pulse Shaping Technology) was added in order to improve the performance and depth capabilities. The complete power management with efficient low electromagnetic interference converters and low self discharge batteries makes this detector even more flexible for worldwide operation.

The LORENZ DEEPMAX Z2 is a high quality specialist metal 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 while small coils are preferably used when searching for small objects like single coins or gold nuggets. Metal identification features have been improved as well as the coils and accessories in order to give better results in the field.

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 instruction manual first before turning the LORENZ DEEPMAX Z2 on. Special attention should be paid to the following notes.

Check out, if the fast charger supplied with the DEEPMAX Z2 fits with the AC mains of your country. See chapter 12 for more detailed information. The supplied recharger will work at AC voltages of 100-240 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 Z2 should be used. When headphones are in use please reduce volume to protect your ears.

When digging for metal objects unexploded ordnance 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 Z2 cannot be made liable for any kind of damage caused by or in conjunction with our products.

Never charge the batteries of your Z2 or the Z2 Power Bank (Battery + GPS module) when these electronics control housings are very warm due to exposure to sunlight or very high ambient temperature. Malfunctioning batteries, chargers or electronics devices must not be used any more! Disconnect the coil connector while charging batteries of your Z2!

Design and specifications subject to change without notice!

2. FUNCTION / APPLICATIONS

The LORENZ DEEPMAX Z2 is based on the non- motion; Pulse GBS (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 electronics 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 metal 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.

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 Z2 without any adjustments. A special adaptation circuit has been added to the detector to suit with five different coil systems automatically. This ensures best performance 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. 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. Even in difficult soils where magnetic iron oxides are present the LORENZ DEEPMAX Z2 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 Z2 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 Z2 to non- ferrous metal objects like gold, silver and copper together with the metal analysis make this detector an outstanding device for many different locating purposes.

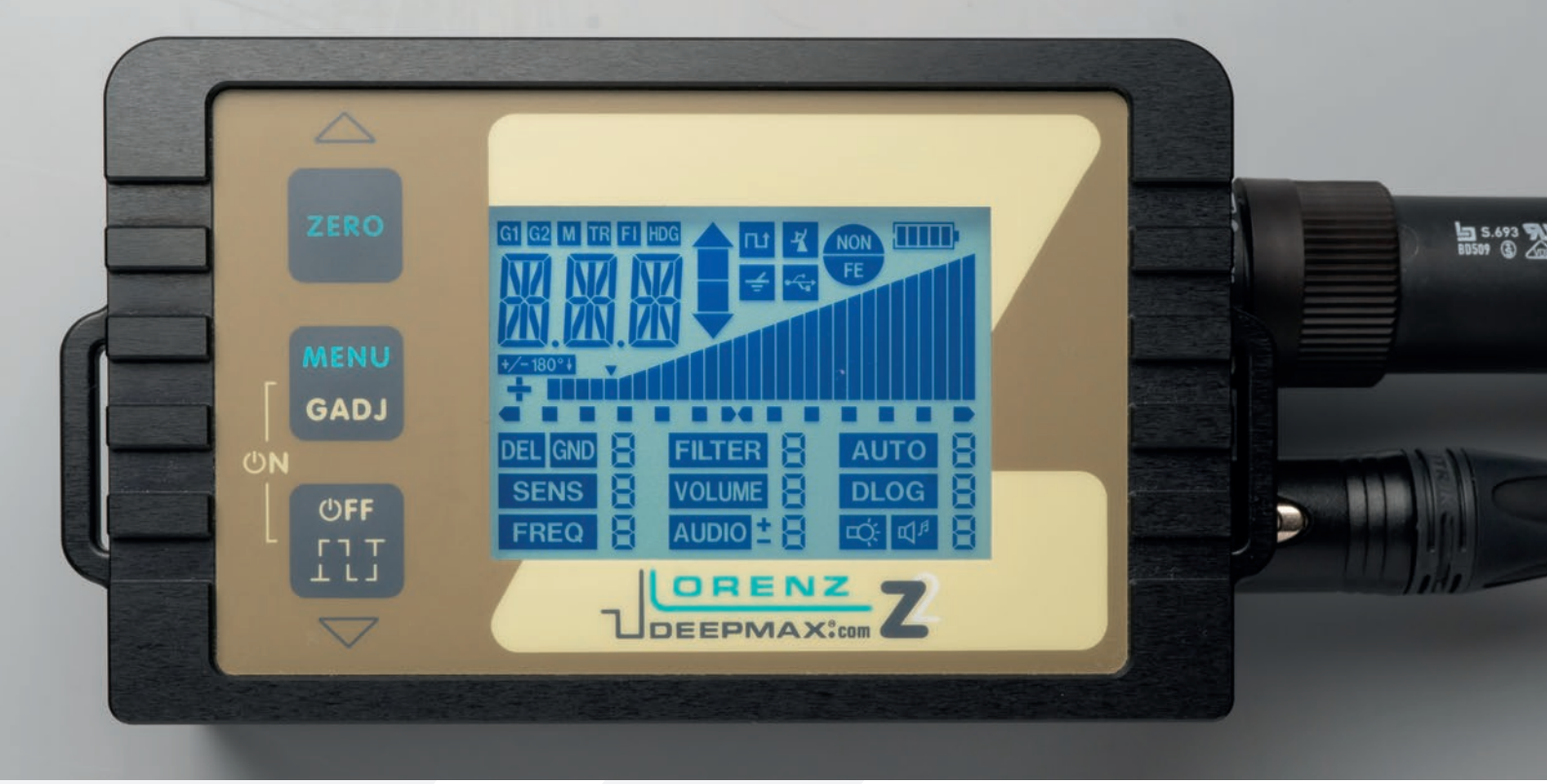
The DEEPMAX Z2 gives a visual indication on the LC Display for every metal being located. This time delay reading producing a number between 000 and 099 helps to classify metal objects. The metal classification circuitry is only in some cases affected by the size of a metal object and therefore identifies small coins as well as large pieces of metal. The LORENZ DEEPMAX Z2 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. 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 Z2 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. The LORENZ DEEPMAX Z2 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 Z2.

- 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 settings
- Logarithmic audio response and intensity bar graph reading for easy pinpointing
- Battery check with audio alarm tone
- Calibrated static (non-motion) 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
- Rechargeable low self discharge NiMH batteries for worldwide operation
- Additional Battery + GPS module (Power Bank) can be connected to double the battery capacity
- Fast charge electronics for worldwide operation 100-240V AC/50-60Hz
- Car charger for 10-30V DC supplies available
- Frequency and Filter function for low frequency EMI interference reduction
- New differential inputs with new coil designs for interference elimination
- Automatic and manual 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 small, low conducting metal pieces
- Low frequency interference elimination circuitry for less low frequency interference
- Enlarged dynamic range for extreme ground signals and easy pinpointing
- Single or dual, induction balanced or differential coil designs can be connected
- Easy to use multi channel data logger function works with additional Hard- and Software 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
- 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



3. LORENZ DEEPMAX Z2 INSTRUCTIONS

On the front panel of the LORENZ DEEPMAX Z2 there are three push buttons to change or alter the functions, retune the Z2 to the ground or storing field data when the data logger is turned on:

ZERO retunes the Z2 or starts the two step auto ground function when pressed for a longer duration.

MENU/ GADJ opens the Menu or starts the manual ground adjust when pressed for a longer duration and a GND function is currently active.

OFF/ FIELD turns the detector off or stores the field data when data logger is on.

1. Pull the two carrying straps of the belt pad through the gaps of the control housing and the pad again. Mount the two plastic connectors at the two sides that they are secure and will not come off. Fix the smaller straps at the top of the Z2 control box. Put on the complete carrying straps with the two belt pads and adjust all straps to comfortable lengths.

2. Mount the search coil with the lower fibre glass rod, fix the other two rods and adjust to fit to your length. Make sure that the connection cable is laid around the rods without any tension.

3. Connect the coil to the Z2 electronics unit afterwards. If additional Battery + GPS module is in use, fasten the same by sliding it from the top in the two mounting plates at the rear belt pad and connect the same with the Z2. Disconnect everything when planning to store.

4. Press **MENU** and **OFF** for 2 seconds to turn on the Z2, when **LOW BAT** appears in the display charge the battery first. With **OFF** the Z2 can be turned OFF again.

5. To start the automatic two steps Ground Balance hold the coil in the air horizontally and about one meter from the ground and press **ZERO** until a high beep sound is coming. Afterwards lower the coil to the ground at a place with no metal and press **ZERO** again until a second low beep sound appears, while keeping the coil steadily in the same position. Arrows pointing up- and downwards indicate the position of the coil. While searching it might be necessary to press the same **ZERO** button shortly to recall the audio threshold setting during operation.

6. Select the different 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 **OFF** downwards quickly pressing the same button repeatedly. After three seconds the Icons will stop to flash automatically. Press **MENU** again in order to change functions. 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…

When a search coil has been exchanged, the unit has been turned off, or the automatic two steps Ground Balance has not been activated a PRESET 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. Position 1 and 2 indicate large metal objects well but reduced sensitivity for small metal objects will be realized, while 3 and 4 will also provide a good sensitivity range for small coins/ foils in addition.

GND 1-6 All metals are indicated while mineralized soils are eliminated in these **GROUND** modes (**GND**= Ground eliminating function turned on). Setting 3 to 6 provide the highest sensitivity range for all types of metal.

GND 1 medium to high conductivity objects like big non ferrous metal objects will be indicated well, low conductive coins and foils will be indicated with a poor sensitivity in this mode.

GND 2 low conductivity objects like coins and foils will be indicated well.

GND 3 low and high conductivity objects will be indicated as **GND1 + 2** works simultaneously.

GND 4 very low conductivity metal objects like small nuggets and foils will be indicated very well.

GND 5 very low to very high conductivity metal objects will be indicated as **GND1 + 4** works simultaneously.

GND 6 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 **GND 1-5.**

Note: It is possible to choose either from the DEL (DELAY) or GND (GROUND) settings, it is therefore not possible to work in both modes 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 sensitivity and 5= high sensitivity

- **VOLUME** settings: 0 no audio and 9 very loud

- **DLOG** turns on in position 1 or 2 the built in data logger function in order to collect field data to produce colour maps with the optional Software and accessories like USB data transfer cable and Battery + GPS module (Power Bank). Please refer to chapter 14 for further details.

- **FREQ** Operating Frequency can be altered to any position in order to provide steady audio sound when electromagnetic 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 to 3 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).

- **TONE 2** increases volume and frequency simultaneously for all metals.

- **TONE 3** will give in **GND** 1-5 a high sound for small non-ferrous metals with low conductivity like many gold nuggets or foils and a low sound with bigger nonferrous and ferrous metal objects. In **GND** 6 or all **DELAY** modes a low sound will appear for all metals. **GND** 6 will be only active with DD-coils connected!

- **TONE 4** provides a low sound with ferrous and high sound for nonferrous or large (hand sized or bigger) ferrous metal objects. This function will only be selectable with DD- coil connected!

- **TONE 5** While moving the coil quickly over the ground the Z2 will respond with a low beep for ferrous and high beep sound for nonferrous or large ferrous metal objects. This is a motion function which will only work while moving the coil with a certain speed over a metal object. Function only selectable with DD-coil connected!

- **+ Transmitter boost** function, when - is selected the Z2 will work with normal transmitting power. When + is turned on the Z2 will work with higher transmitting power in order to give stronger signals for deeper and bigger metal objects at the expense of some battery usage time.

4. DISPLAY AND SETTINGS

During operation it is always possible to change the settings of the Z2. Above the function icons which will be shown all the time there is an intensity bar graph, another +/- GPS direction finder and differential bar graph indicator which will come on when differential coils are connected, data logger icons, battery indicator, a **FE**rrous/ **NON- FE**rrous icon (works with double D coil only) and a conductivity number in order to display the time duration of the eddy currents produced in a detected metal object.

000-099 CONDUCTIVITY / TIME DELAY READING

The number for the conductivity/ time delay measurement is static and 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 objects size is displayed with a specific number on the LC Display. 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. Possible indications without guarantee:

- **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

FERROUS / NON-FERROUS ICONS

This function does only work with the 26 cm or 35 cm double D- coils. 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 or large ferrous objects 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. There will be a minimum speed of the coil necessary since this is a motion function.

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 DIRECTION FINDER AND DIFFERENTIAL INDICATOR

It is possible by means of the smaller bar graph with center indication to find the direction to walk each track with data logger turned on and external Battery + GPS (Power Bank) module connected. It is also possible to indicate under which part of a search coil a metal piece is located when a differential coil is connected by the same +/- bargraph dot.

ARROW; AERIAL, USB ICONS

These icons will work together with the built-in data logger function. Optional accessories like USB data transfer cable, Battery + GPS module (Power Bank) and Surfer Software will be also necessary when collecting and displaying field data. For further information please refer to the instructions for use the LORENZ DEEPMAX Z2 with data logger function and software at chapter 14.

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. The LORENZ DEEPMAX Z2 will turn OFF automatically a short time after this sound appears to avoid damage from the batteries.

Recommended settings for small coils (26 cm to 44 cm diameter) Nuggets/ Coins/ Relics:

- **Nuggets/ High mineral:**
GND3-5, FILTER 1, Auto 0-2, SENS 4-5, Volume 5, DLOG 0, FREQ 5, AUDIO 2, LIGHT 8, TONE 3

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

- **Coin/ Relic double D coil**
GND 2-5 (high mineral) or 6 (low mineral), FILTER 1, AUTO 0- 2, SENS 4-5, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 2 or 3

Recommended settings for large frame coils (1m x 1m to 3m x 3m) Cache/ Relics/ Meteorites:

- **Low/ Medium mineral:**
DEL 3 or 4, Filter 3, AUTO 0, SENS 4-5, VOLUME 5, DLOG 0, FREQ 5, AUDIO 0, LIGHT 8, TONE 1, Keep coil at constant height of 20-60cm over the ground.

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

5. CONNECTORS / LOUDSPEAKER

COIL JACK

Search coils of different size and shape can be connected to this jack. The search coils available for the LORENZ DEEPMAX Z2 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: Some coils and adapters have been changed and improved therefore refer to newest Z2 coils only!

HEADPHONES/ CHARGER/ EXTERNAL BATTERY + GPS MODULE / USB DATA TRANSFER JACK

The stereo headphones can be connected with the supplied adapter cable to this jack. Any stereo headphones ranging from 8 to 100 Ohms can be connected. The built- in loudspeaker will be automatically turned off when headphones are connected.

The built in NiMH battery can be recharged with the supplied charger when connected to the same jack.

An optional external power supply Battery + GPS module (Power Bank) will double the battery capacity when being connected to this jack. At the same time the GPS will support the Z2 built- in data logger.

After collecting field data the same can be transferred via the same connection to the computer via an optional USB data transfer cable using the same jack. It is also possible to update the firmware of the Z2 by means of the same data transfer cable connected to a computer and this jack.

Any connectors should be disconnected when the Z2 is not in use or when planning to store the unit in order to avoid a slow discharge of the batteries.

LOUDSPEAKER

The LORENZ DEEPMAX Z2 has got a built-in loudspeaker which gives an audible signal when the search coil approaches to 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.

6. OPERATING PROCEDURES

Connect the search coil-connector to the COIL jack of the electronics unit, and fasten the plastic sleeve of the connector by rotating it clockwise. At switch ON the detector runs through a display check sequence since all the icons come on and indicate the retuning process is performed by the electronics at the same time. Right afterwards the firmware version is shortly displayed as well. Afterwards the detector will automatically turn to the settings which were selected the last time the detector was in use. While pushing the three push buttons different settings will be selected and can be altered by means of the same controls at the bottom of the LC display.

Hold the connected search coil at constant distance above the ground and move the coil slowly from side to side in overlapping manner with the telescopic pole in order to be able to detect even the smallest metal pieces. Avoid a speed of more than 2 meters per second when moving the coil even though the response speed of the Z2 is very high in **FILTER** settings 1 or 2.

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 in the near of 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 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 at places where there is no metal in the near of the search coil.

As the LORENZ DEEPMAX Z2 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.

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 always needs to be retuned via the **ZERO** control with the two step ground balancing function as described in chapter 3. If this is not performed the preset ground values are in use. When lowering the search coil to the ground an audio sound may appear, this can be cancelled by pressing the **ZERO** control again shortly. The distance between the search coil and the ground has to be kept at a constant height when searching in **DELAY** modes afterwards. If too strong signals from the ground are noticed simply change from **DELAY** to **GROUND** functions, afterwards there will be no or very week indications of the ground. When working with small search coils of up to 44cm 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 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 hold 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.

In the **DEL** 1 and 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 + GPS module and the frame coil.

7. IDENTIFYING METAL OBJECTS

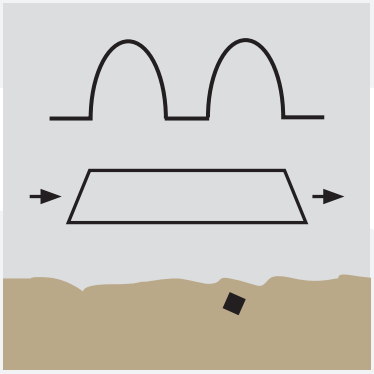
This chapter is a summary on how to proceed with the LORENZ DEEPMAX Z2, when locating metal, while using the two metal classifications, intensity reading and the audio signal. It is therefore in some cases possible to predetermine the exact position the size as well as the kind of metal located. When 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 and shape information can be derived from the audio sound 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 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.

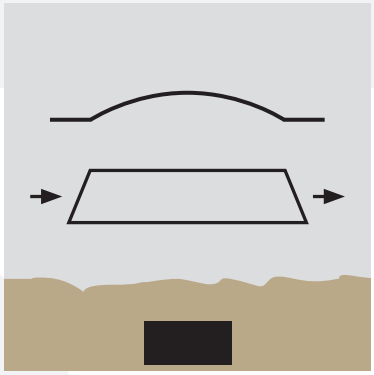
Deeply buried metal objects will generate a weak and slowly increasing audio sound and intensity meter reading. Objects which are close to the surface generate a strong and rapidly increasing signal.

Large objects will cause a signal with a long duration especially when located with large frame mounted cable coils. For example, a metal box 20cm x 20cm can give a signal of up to 6m in length when passing with a (2m x 2m) 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 intensity is sufficient.

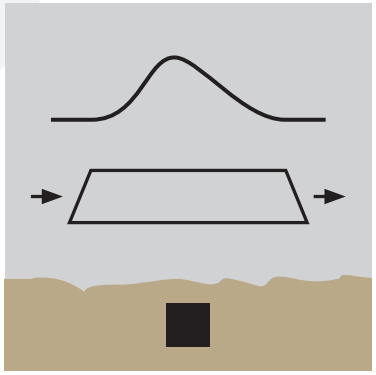
A specially developed electronic circuit makes time delay readings possible which are directly displayed on a scale of 000 to 099. Those so called conductivity readings are only known from VLF TR machines but not from metal detectors based on the Pulse-GBS principle. In general, these readings are based on objects size, conductivity and permeability of the metal and therefore named time delay readings for simplicity. 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 Z2 has to be ground balanced first as shown in the chapter 3 to avoid false indications produced by the ground. Larger ferrous metal pieces will also be indicated as being non-ferrous.



small object at the surface



large object buried deep



medium size object

8. AUTOMATIC GROUND BALANCING GND

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 with false indications in the **DEL**= DELAY modes however it is always advisable to work with the built- in Ground Balancing System (GBS) with the GROUND = **GND** function turned on. Different **GND** functions can be selected 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. The Sensitivity to ferrous metal objects is greatly reduced in **GND** 1-5 modes.

For automatic ground balancing tuning purposes please go on as follows: Hold the search coil horizontally about 1 m to 2 m 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 or single magnetic stone 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 in order to indicate the tuning process. High and low beep sounds will also appear. 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 **GND** 1-6. During operation it might be necessary to retune the ground settings from time to time.

The LORENZ DEEPMAX Z2 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. In some cases it might be necessary to keep a small distance between the coil and the ground when pressing **ZERO** for the second time in the automatic two step ground balancing procedure.

In selected **GND** 3 or **GND** 5 modes the Detector will distinguish automatically between the two signals and will select the stronger signal of two **GND** modes. In most cases however the **GND** 2 or 4 function will be sufficient. It is only necessary to run through the whole tuning process when changing the coil or turning off and on again the Z2. When Double D coils are in use, the **GND** 6 function will be also selectable but works differently compared to the previous explained. The detection depth to many non- ferrous metal objects will increase when **GND** 6 is in use with that coil. In some cases however higher iron oxide contents of the ground makes the Z2 unstable in **GND** 6 position and therefore should not be used.

In the case that very high mineralization is expected **GND** 1 will be a good choice with some expense of sensitivity to small metal objects.

With turned on **GND** function the LORENZ DEEPMAX Z2 works with either reduced or higher sensitivity compared to **DEL** Delay modes. 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. 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 modes.
An increase in interferences with turned on **GND** function due to power lines and radio transmitters will be realized. The amount of interference could only be reduced by the way of changing to smaller or differential 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.

When a **GND** function is active, it is possible to alter the **GND** settings manually by pressing the **MENU/ GADJ** = GROUND ADJUST push button for a longer duration. As long as G1 and G2 icons are active in the display simply alter the settings with the upper or lower push button in single or tenner steps while pressing the same buttons for a longer duration (**ZERO** and **OFF**). Please note that only **GND** 1,2,4 and 6 can be altered! To leave the same function simply press the same **MENU/ GADJ** button shortly.

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 Z2 are based on different working principles. The time delay/ conductivity reading is static therefore no motion of the coil is required to make a reading 000 to 099 possible. This is especially of great advantage when identifying deeply buried metal objects with the highest sensitivity possible. The calibrated metal classification will directly display the time delay 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: Slowly 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 Z2 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 reading is performed by the LORENZ DEEPMAX Z2.

conductivity reading	possible metal object
0-10	coin, ring, ring pull, aluminium foil, small coin
10-20	small bronze-coins, silver-coin
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, aluminium, gold objects

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.

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 Z2 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 bigger metal object on the screen. The reading may also lie between the two different kinds of metals.

The time delay/ conductivity metal classification of the LORENZ DEEPMAX Z2 will work with all available coils. 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.

Some nails or longer ferrous objects produce different signals like for example 50-60 at the edges and 35 in the middle, when passing them with the coil.

Note: When expecting mineralized soils it is necessary to tune the detector to the ground first with the two step ground balancing procedure. The* FE/ NON FE, *Ferrous / Non- ferrous metal identification is of great help when classifying smaller objects in weakly or medium mineralized soils with DD- coils. With magnetic ground however this indication is less accurate. The coil has to be hold at a constant height a few centimetres over the ground while moving slowly in order to make an indication possible (Motion principle). Very big Ferrous metal object like horseshoes ore bigger will cause a* NON FE *indication.

10. SEARCH COILS / ACCESSORIES

Different search coils can be connected to the LORENZ DEEPMAX Z2 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 Z2 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 1,5 m x 1,5 m, 2 m x 2 m or 3 m x 3 m. In that case it will no longer be possible to detect single coins or small nails with those very large frame mounted search coils. In this chapter different search coils available with the LORENZ DEEPMAX Z2 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 the 26 cm diameter coil with separate transmitting and receiving windings is also available. This coil makes FERROUS / NON-FERROUS indications on the display of the DEEPMAX Z2 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.

26CM DIFFERENTIAL SEARCH COIL

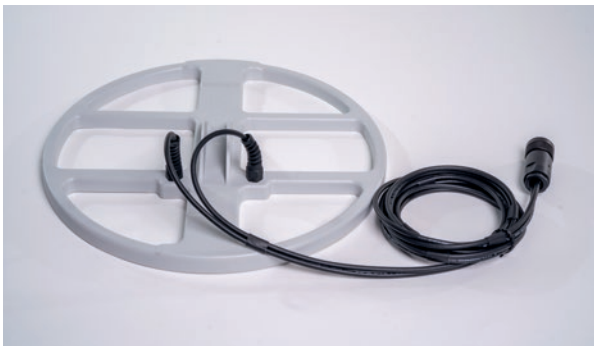
This particular search coil consists of three coils inside. A special circuitry of this coil and the Z2 with its high precision differential input, subtracts the signals of two coils in order to eliminate interferences from power lines or radio transmitters. Even signals from magnetic soils are eliminated as long as the coil is hold in parallel to the ground.

Compared to single coils the sensitivity to bigger metal objects is reduced. In most cases however the reduction of sensitivity is often accepted due to the stable and accurate operation in areas with plenty of electromagnetic interferences.

Compared to single coils this coil design will give a completely different signal response with two indications at the sides and a minimum point in the center of the coil. On the display beneath the main bar graph there is a +/- indication which will come on for easy pinpointing when this differential coil has been connected.

35CM SEARCH COIL

This highly sensitive search coil has got very good depth capabilities on single coins and medium sized objects. Nuggets smaller than 5 mm in diameter should rather be detected with a 26 cm 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 / 44 cm).



35CM DOUBLE D SEARCH COIL

Separate transmitting and receiving windings offer more stable operation on soils with changing contents of iron oxides (minerals). The FERROUS / NON-FERROUS metal identification does work with these 26 cm and 35 cm double D search coils. It is simple to locate small coins with this search coil. When expecting very small coins or nuggets a 26 cm single coil is a better choice.

Note: The electrical properties of the double D search coils may change when mechanical tension or high temperature is put on the coil when being used or stored not properly. The same with the connecting cable which should be fastened with the belt strap first before connecting it to the electronics unit to protect the same and to avoid broken cables.

44CM SEARCH COIL

This search coil can be operated by a single person with the telescopic-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 more than 50 cm on a single gold coin with 25 mm 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 44 cm coil is more efficient as it covers much more ground than a 26cm coil does. Coins with a diameter of less than 15mm should rather be detected with smaller search coils.

1 M X 1 M FRAME COIL WITH CABLE MOUNTED ON TUBES

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

UNIVERSAL CABLE COIL 4 M PERIMETER

This search coil is identical with the 1 m x 1 m frame coil described before, but it is supplied without a frame. Therefore a self made metal free frame has to be built first, before mounting the same cable on it. This coil should only be laid out with a single winding.

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 hold in parallel to the ground at a constant distance of 10 to 60 cm. In order to avoid false signals the electronics control box or additional power bank should always be carried far away from the field of the search coil. It is also necessary not to wear any belts or shoes with metal content when working with the LORENZ DEEPMAX Z2.

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 0,67 m x 0,67 m 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.

1 M X 1 M (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 1 m x 1 m PVC- tube frame for example. Searching with the 1 m x 1 m 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 10 cm x 10 cm. Because of the size of the coil most of the small metal fragments will be ignored. However bigger nails can be identified with the conductivity/ time delay metal identification. Most of the smaller 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 1 m x 1 m frame coil is achieved with intense and therefore deep going magnetic field transmitted. For even higher detection depths use the 12 m cable coil which can be arranged to 1,5 m x 1,5 m or even 3 m x 3 m frames.

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 1 m x 1 m frame coil does. It should only be used when searching for metal objects with a surface of at least 20 cm x 20 cm 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 1,5 m x 1,5 m or 3 m x 3 m 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 2 m x 2 m coil acts as a large aerial for medium wave transmitters. 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 8 m 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 1 m x 2 m 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 center part as this is the middle of the eight (8). This type of frame mounted search coil is about 30% less sensitive than a 1 m x 1 m 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 1 m x 2 m frame mounted search coil is of great advantage when locating metal objects in areas where interferences are often expected. This type of coil has a very poor sensitivity to small metal objects. The minimum surface of a metal plate should be 10 cm x 10 cm to ensure good results when working with this coil. The LORENZ DEEPMAX Z2 will work very stable with this particular coil. The following described 1 m x 1 m 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).

UNIVERSAL CABLE COIL 12 METERS PERIMETER 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 two different frame coils by simply mounting one or two 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 Z2. The high sensitivity for large and deeply buried metal objects and the simple elimination of smaller

metal fragments make these two 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 the near of power lines the amount of interferences produced will be higher than with smaller coils and therefore again the sensitivity might be reduced. The ground balancing system **GND** should be changed to **DEL** 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 100 cm the same way as the differential double frame coil described below. A Z2 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.

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 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 tubes 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 tubes. 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 upper 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 to 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 1 m x 1 m 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.

11. DETECTION DEPTHS

DETECTION DEPTHS I	26 cm coil	35 cm DD coil	35 cm DD coil GND6*	44 cm coil	1 m 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 30 x 18 x 15 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 6**
X = outside the range of the coil

DETECTION DEPTHS II	26 cm coil	35 cm DD coil	44 cm coil	1 m 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 30 x 18 x 15 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 Z2 is supplied with a built-in rechargeable NiMH battery which will power the electronics approximately 3 to 8 hours depending on the coil connected the settings of the Z2 and the environmental temperature conditions. The usage time will be 6 hours under average conditions. With the optional Battery + GPS module the battery capacity can be simply doubled when being connected to the Z2. Both batteries will be discharged simultaneously when doing this. When connecting a very low discharged external battery supply the Z2 will turn OFF automatically! Four red lights will indicate the battery condition of the optional Power Bank when pressing the push button on this device shortly. When pressing the **BAT**/ **GPS** button for a longer duration the built- in GPS will be turned on or off again. This will be indicated with the flashing green light. When the battery is too low the GPS will be turned off automatically in order to avoid a low discharge of the built- in battery. A discharged battery should be recharged with the supplied fast charger. Therefore the plug of the charger has to be connected to the universal connector of the Z2 or Power Bank and the AC- plug of the charger to the mains. The fast charge electronics will automatically change to a trickle charge mode or turns off when the battery is full. The different charge modes are indicated via the red/ orange/ green light on the charger:

LORENZ DEEPMAX Z2 CHARGER FW 7219:

- flashing **orange** slowly = Pre charge
- flashing **green** rapidly = Rapid charge
- flashing **green** slowly = Top of charge
- **green** = Charge complete
- flashing **orange** rapidly = Error
- **orange**/**green** flashing alternately = Temperature Battery or ambient temperature too high, wait, (after the Batteries have cooled down the charger automatically continues with charging the Batteries)

LORENZ DEEPMAX Z2 CHARGER 2115
LORENZ DEEPMAX Z2 CAR CHARGER 2515 (OPTIONAL)

- **orange** = No battery connected or Initialization
- **red** = Fast charge
- **green** with short yellow flashes = Top of charge
- **green** = Charge complete/ Trickle charge
- **red** and **green** flashes = Failure/ Temperature Battery or ambient temperature too high

The maximum recharge time is limited at approx. 3,5 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 due to -delta U and temperature detection of the charger.

The Z2 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.

When disconnecting the charger from the mains it is important to disconnect the plug from the Z2 as well to avoid a slow discharge of the built- in batteries!

The supplied charger has got a wide range of input voltages in order to fit with any country mains. In conjunction with the NiMH batteries which are considered as dry batteries with no specific transport obligations for land maritime or air, this battery/ charge system is therefore designed for worldwide operation. 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.

The capacity of the battery can always be checked when turning the LORENZ DEEPMAX Z2 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. The supplied batteries have a very low self discharge therefore fully charged batteries will have approximately 70 to 80% of their capacity after one year time. 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 by your dealer or manufacturer necessary.

The following safety information must be read before using the charger supplied with every DEEPMAX Z2 detector:

- Please read the user instructions before using the charger
- For indoor use only (protect against moisture)
- Do only use to recharge NiMH batteries available from the manufacturer of the LORENZ DEEPMAX Z2
- Rechargeable batteries supplied with the LORENZ DEEPMAX Z2 contain chemical substances they are subject to special waste disposal.

Note: Only spare parts and accessories available from the manufacturer of the LORENZ DEEPMAX Z2 should be used. Turn off the LORENZ DEEPMAX Z2 when it is not in use or when planning to store it. Recharge a discharged battery immediately. Disconnect all plugs from the control box when transporting or planning to store it! Please make sure that the universal connector of the Z2 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!

Never charge the batteries of your Z2 or the Z2 Power Bank (Battery + GPS module) when these electronics control housings are very warm due to exposure to sunlight or very high ambient temperature. Malfunctioning batteries, chargers or electronics devices must not be used any more! Disconnect the coil connector while charging batteries of your Z2!

Charger Input data:
UE = 100-240 VAC/50-60 Hz

Car Charger Input Data:
UE = 10-30 VDC

13. INTERFERENCE

The LORENZ DEEPMAX Z2 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 Z2 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.

Near transmitters or when other metal detectors are working close to the DEEPMAX Z2 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 Z2. Therefore it will be sometimes necessary to change the frequency **FREQ** to suppress some interference. The **FREQ** Frequency function can 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 Z2 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 Z2 will be slightly reduced, but the amount of false signals will also be reduced. When connecting a smaller search coil the amount of interference can also be reduced.

The compensated 1m x 2m frame mounted search coil the 1m x 1m double frame coil or other differential coil designs do not suffer from interferences and therefore should be in use when strong Electromagnetic interferences EMI are expected.

This will always guarantee a very stable operation of the LORENZ DEEPMAX Z2. 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. When interferences are expected the LORENZ DEEPMAX Z2 has to be tuned with FREQUENCY, FILTER first.

The electronics unit of the LORENZ DEEPMAX Z2 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 Z2 control box need to warm up to their working temperature.

When working with small search coils the **AUTO** function can also be used to make the detector work more stable.

14. DATA LOGGER / ANALYSING FIELD DATA

To generate colour, image, surface or contour maps with the Lorenz DEEPMAX Z2, additional Hard- and Software is necessary, like an USB data transfer cable, Battery + GPS module (Power Bank), Lorenz Scripter Software with installation instructions available on our website for free download at Service and a Surfer software single user license available directly at Golden Software as well as a computer running on Windows.

A very sophisticated multi channel data logger function of the DEEPMAX Z2 metal detector will take simultaneously different channels of data when passing the ground with several tracks and stores the information into memory when this DLOG function is selected. After recording field data the scientific Surfer Software easily and accurately transforms the stored data into colour, contour, surface, image or vector maps on a computer in minutes. An additional Lorenz Scripter 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 Z2 Data Logger Hard/Software developed by Lorenz Detecting Systems is first of all easy to use, very accurately working and affordable. Only three controls of the DEEPMAX Z2 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 different ways. The operator therefore can use the 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, while giving indications to magnetic soils as well. Two ground channels will enable the operator to generate maps with no ground response but Z dimensions for different decay curves of the eddy currents produced in low or high conducting metal objects. In addition, the metal classification channel will display the time delay of the eddy currents of each signal with a specific colour 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 will be immediately seen when comparing the six channels. In addition GPS data is also recorded from an optional Battery + GPS module to support the user with a compass function a length measurement of each track and also provides the coordinates of the starting point of each field in the colour maps.

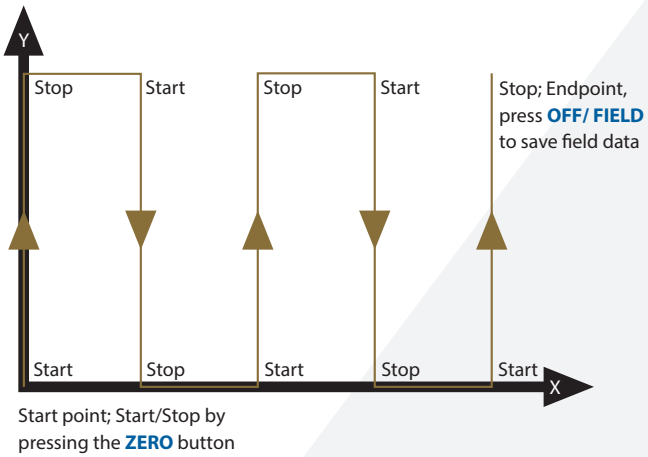
The GPS can be turned on and off when pressing the BAT/GPS button of the Power Bank for a longer duration. A green light will flash shortly when GPS is on.

In the case that an additional external GPS is connected to the Power Bank there will appear two short green flashes instead of single flashes. If pressed shortly the battery condition of the Power Bank will be displayed with four red lights.

To start the data logger and collect field data find a point in the left corner of the field and also mark each corner of the field you are going to scan.

Fields of 20m x 20m or 10 x 20m make sense. It makes no sense to scan very narrow fields with three tracks only! To be sure that there is no overlap simply use the width of the coil like 1m for a 1mx 1m frame when walking each track. It is important to proceed with the tracks from the left to the right since the visualization software will work the same way!

SAVING FIELD DATA WITH THE LORENZ DEEPMAX Z2 DATA LOGGER



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

2. Turn on the **DLOG** function with 1 for normal or 2 for highest Sensitivity. In this mode only a few functions can be changed or displayed, all the other functions are shown with a P for preset and cannot be altered.

3. Keep the coil at the left starting point where X and Y lines meet and press **ZERO** shortly and immediately start to walk the first track while keeping the coil at constant height over the ground. A pulsed beep sound will indicate that the data acquisition is in progress. Walk at a constant speed while recording the field data.

4. Press **ZERO** at the end of the first track in order to store the same track in the internal memory. A double tone beep sound will confirm that the data is stored in memory.

5. Turn around 180 degrees and start the next track backwards for example 1m next to the first one pressing **ZERO** to start. Avoid overlaps of the tracks when searching track by track.

6. Stop the last track with **ZERO** and store the same as a new field while pressing **OFF/ FIELD** shortly afterwards.

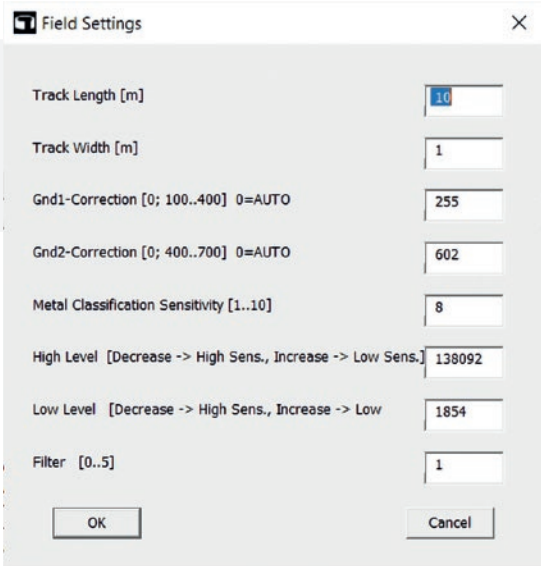
7. Leave the DEEPMAX Z2 on and connect the USB data transfer cable to the DEEPMAX Z2 and read the data with your computer and installed Surfer and Lorenz Scripter Software, as described in the instructions free for download on our website at Service.

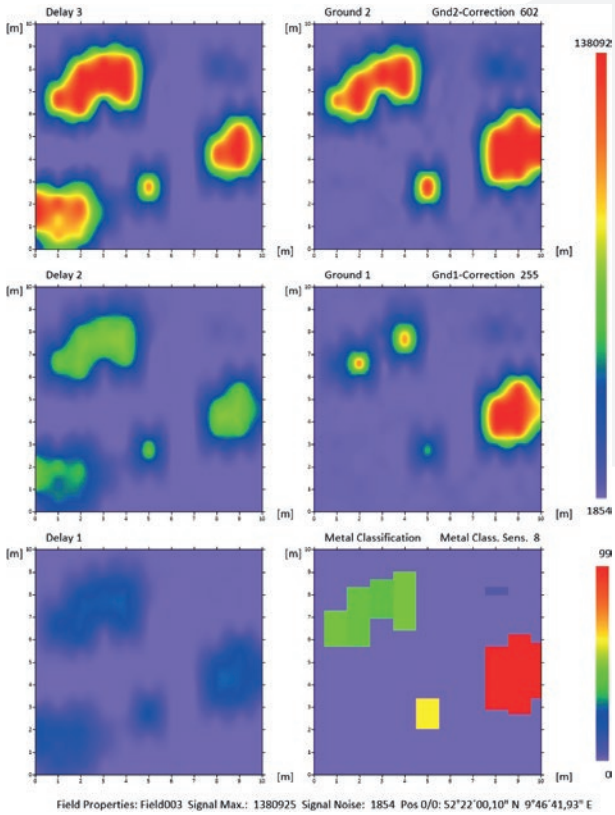
8. Compare the six different colour maps generated with Surfer to distinguish between different kinds of metals, objects sizes, orientation and ground minerals.

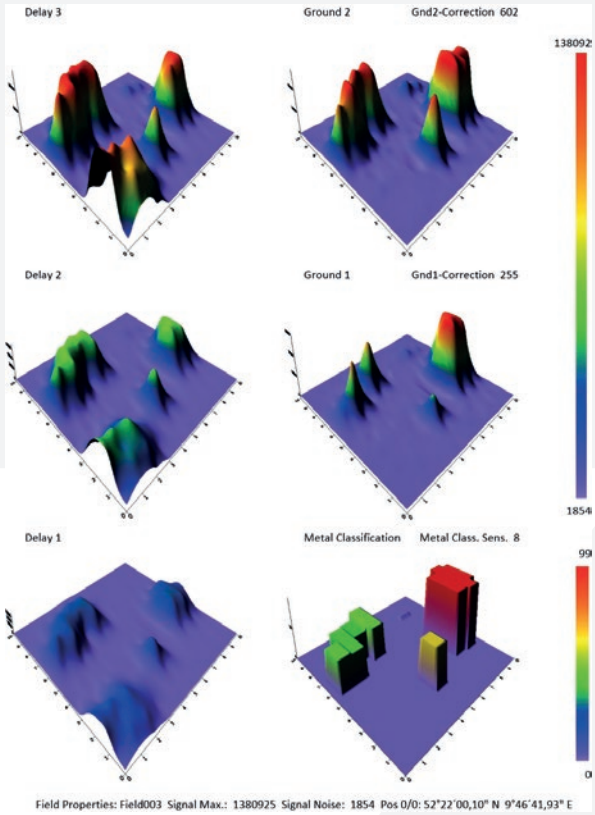
In addition, there are different indication icons on the display to make the operation of the data logger even simpler as follows:

- **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 X 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 FIELD button shortly.
- **HDG Heading** information of the compass function to display the direction of the tracks in Y direction. 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 obtain the compass heading.
- **GPS** has to come on when a Battery + GPS module is connected the GPS is turned on and **DLOG** 1 or 2 is selected and starts to flash when no accurate GPS data can be received or during the warming up phase. The Z2 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.
- **BARGRAPH 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.
- **USB** icon comes on when USB data transfer cable is connected with the computer and data transfer is in process.

All mentioned functions, settings, specifications and indication examples subject to change without notice.







ANALYZING FIELD DATA

Although the detector can be used with smaller search coils 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 analyse the different pictures generated with the software refer to the following instructions. Compared to many other systems the Lorenz DEEPMAX Z2 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 and size of a metal object being located. The advantages of the multi 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 colour maps select signals in the GROUND channels and try to compare the same indications with DELAY and Identification channels.
- 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 or more coloured dots on the metal classification or Ground channels.
- Some longer ferrous metal objects lying horizontally in the ground will cause a special double signal when looking at the Ground channels.
- Ferrous metal objects will only give weaker signals in Ground modes and therefore a small indication in Z direction in the three dimensional surface maps only.

- Looking at the Ground channels most of the ground and some of the smaller ferrous items will no longer be displayed when comparing them with the Delay channels.

- On the metal classification pictures stronger signals which generate a conductivity reading will produce mainly a single colour dot corresponding to the delay reading on the display of the DEEPMAX Z2. Neutral ground will cause a purple indication. Different nearby metal objects lying in close proximity will give different colours in most cases for better selection. See table of metal classification indications:

Colour Surfer	metal classification/ reading Z2	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 Z2 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 jackets, 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 Z2 are waterproof up to the connector which is not water proof. All the connectors should be kept dry and disconnected from the Z2 unit when not in use.

The LORENZ DEEPMAX Z2 is ruggedly designed. All necessary electronics 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.

FIRWARE UPDATE

When planning to update your Z2 with a new firmware version please refer as follows:

- Turn **OFF** the Z2 and connect the optional USB cable to the Z2 and the computer.

- Push simultaneously in the order 1 **ZERO**, 2 **MENU**, and 3 **OFF** to turn on the Z2 and to start the data transfer function which will be indicated with a single USB icon coming on.

- Select a new firmware version provided on our website at Service and proceed as described in the instructions on our website.

- It is strongly recommended to have charged batteries and not to disconnect anything while data transfer is in progress.

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.

The guarantee is not valid when disregarding the 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
- Low discharge of the built- in batteries
- Putting tension on DD coils or pulling connection cables

In case of a malfunctioning Z2 device or any kind of unstable operation please check the capacity of the battery the condition of the connectors, cables and search coils first.

In the case of any false functions or problems occurring with your LORENZ DEEPMAX Z2 detector do contact your dealer where you have purchased your detector first as they will know what is wrong with your unit and will find out if the device has to be returned to the manufacturer or if they can repair the device by themselves. Therefore please do refer to the dealers listed on our website only.

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16. STANDARD EQUIPMENT / ACCESSORIES

LORENZ DEEPMAX Z2 BASIC ELECTRONICS WITHOUT SEARCH COILS:

- LORENZ DEEPMAX Z2 electronics control box
- Adjustable shoulder and belt strap
- Fast charger with wide range 100-240 VAC input
- Stereo headphones with adapter cable
- Instruction manual English

LORENZ DEEPMAX Z2 STANDARD DETECTING KIT INCLUDES IN ADDITION:

- 1m x 1m frame coil with carrying straps
- Carrying bag for 1m x 1m frame coil
- 35cm DD- coil
- Three rods telescopic S pole

OPTIONAL ACCESSORIES:

- Search coils diameter ranging from: 26cm 35cm, 44cm, single, double D or differential versions
- Telescopic S pole with three rods
- Universal cable coils 4m, 8 m, 12 m perimeter
- Single and double frame coils 1m x 1m
- Carrying bag for single frame coil 1m x 1m
- Extension cables 5 m for frame coils
- Z2 -Y- cable for double frame coils
- Car charger 10-30V DC
- Z2 USB data transfer cable
- Z2 Battery + GPS Module (Power Bank)

To generate colour maps with the DEEPMAX Z2 built-in data logger function the following accessories will be necessary in addition:

- computer with installed software
- Surfer scientific mapping software (single user license) available directly at Golden Software www.goldensoftware.com
- Lorenz Scripter latest version with complete installation instructions available for free download at www.metaldetectors. de
- Z2 USB data transfer cable
- Z2 Battery + GPS Module (Power Bank)

17. SPECIFICATIONS

ELECTRICAL DATA Z2

Search-frequency with small/large search coils connected	approx. 1270/600 pulses per second
Audio response voltage controlled oscillator VCO and volume/ threshold control	0-4000Hz
Power supply	built-in rechargeable NiMH battery 12 V 2,4 Ah low self discharge
Usage time	approx. 3 to 8 hours depending on tempera-ture connected coil and Z2 settings
Battery charger	rapid charger with 100-240 VAC/50-60Hz for world-wide operation
Operating temperature	-5 bis +50°C
Detection depths	see chapter 11
Data logger	built- in

Multi channel data acquisition, supported by GPS	
Storage media	internal memory
Number of fields	99
Maximum length of single track	100m
Sampling rate	12 per second
Maximum data acquisition time	8 hours

BATTERY + GPS MODULE, OPTIONAL

External power supply with GPS receiver Head-phones/ recharger and external GPS jacket

Battery indicator	4 LED's
Battery	12 V 2,4 Ah NiMH
External GPS jacket	RS232input: 9600Bits/s, No Parity, 8 Databits, 1 Stopbit
Channels	72
Satellites	GPS, Galileo, Glonass, Baidou
Protocol	NMEA-0183 V3.01 RMC
Sensitivity	-165 dBm
Accuracy	Position Horizontal 2.5m CEP
Working temperature	-5°C bis +50°C
Dimensions	131x105x41mm
Weight	approx. 730g

DIMENSIONS

Electronics control box	140 x 85 x 79 mm
1m x 1m frame coil (collapsed	1080 x 150 x 150 mm
Extended S-rod length	max. 1550 mm min. 1030 mm
Collapsed S-rod length	690 mm

WEIGHT

LORENZ DEEPMAX Z2 electronics control box	ca. 1380g
Telescopic S pole	ca. 600g
26 cm single coil	ca. 500g*
26 cm double D coil	ca. 600g*
35 cm single coil	ca. 600g*
35 cm double D coil	ca. 800g*
44 cm single coil	ca. 700g*
1m x 1m frame coil	ca. 1900g*
Universal cable coil 4m perimeter	ca. 550g
Universal cable coil 8m perimeter	ca. 600 g*
Universal cable coil 12m perimeter	ca. 900g*
1mx1m double frame coil kit	ca. 7300g*
Y-Adaptor cable	ca. 150 g

*all weights taken with connecting cable and connector!

To operate the coils ranging from 26cm to 44cm diameter a telescopic S pole will be necessary for operation. All coils are interchangeable, electrically shielded and waterproof up to the connector. The connectors themselves are not waterproof!

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 labelled 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.

Design and specifications subject to change without notice!

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