



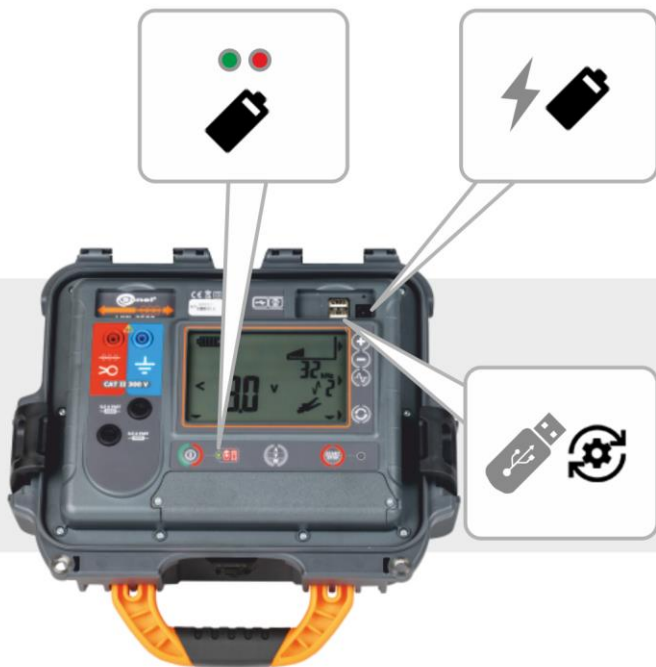
USER MANUAL

CABLES AND UNDERGROUND INFRASTRUCTURE LOCATOR

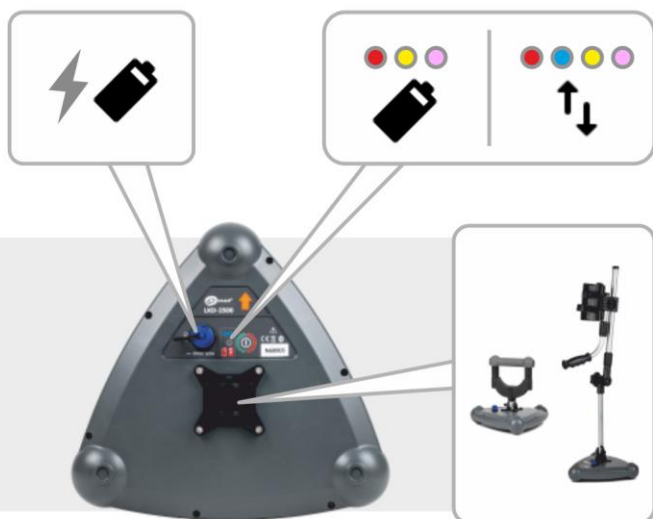
LKZ-2500

LKN-2500 • LKD-2500 • SONEL LKZ MOBILE

LKN-2500



LKD-2500





USER MANUAL

CABLES AND UNDERGROUND INFRASTRUCTURE LOCATOR

LKZ-2500

LKN-2500 • LKD-2500 • SONEL LKZ MOBILE



**SONEL S.A.
Wokulskiego 11
58-100 Świdnica
Poland**

Version 1.03 11.09.2024

LKZ-2500 is a modern, high quality measuring system, easy and safe to use. Reading and using of this manual will help to avoid errors in measurements and prevent possible problems when operating the instrument.

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1 General information

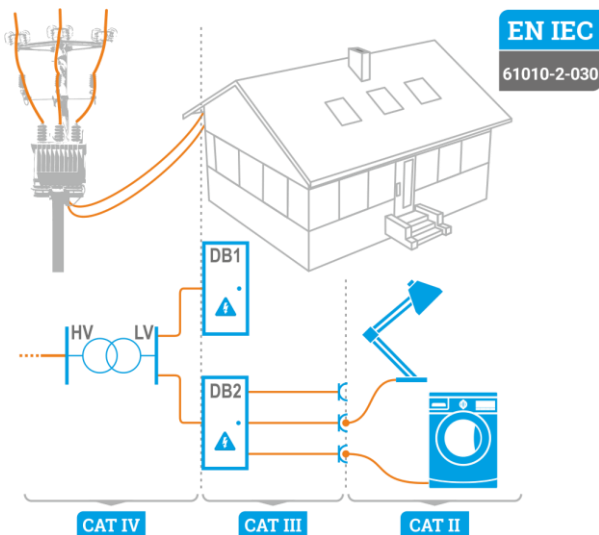
1.1 Safety symbols

The following international symbols are used in the device and/or in this manual:

| | | | | | |
|--|---|---|--|---|--|
|  | Warning. See explanation in the manual |  | Attention, risk of electric shock |  | Double insulation (protection class) |
|  | Fuse |  | Declaration of Conformity with EU directives (Conformité Européenne) |  | Do not dispose of with other household waste |

Measurement categories according to EN IEC 61010-2-030:

- **CAT II** – concerns measurements performed in circuits directly connected to low voltage installations,
- **CAT III** – concerns measurements performed in buildings installations,
- **CAT IV** – concerns measurements performed at the source of low voltage installation.



1.2 Behaviour of signalling LEDs



The LED is on continuously



The LED flashes slowly



The LED flashes rapidly

1.3 Safety

In order to provide conditions for correct operation and the correctness of the obtained results, the following recommendations must be observed:

- Before you proceed to operate the system, acquaint yourself thoroughly with the present manual and observe the safety regulations and specifications provided by the producer.
- Any application that differs from those specified in the present manual may result in a damage to the system and constitute a source of danger for the user.
- The LKZ-2500 system must be operated only by appropriately qualified personnel with relevant certificates authorising the personnel to perform works on electric systems. Unauthorized use of the system may result in its damage and may be a source of serious hazard to the user.
- Before connecting the system to power cables, they must be discharged.
- Using this manual does not exclude the need to comply with occupational health and safety regulations and with other relevant fire regulations required during the performance of a particular type of work. Before starting the work with the system in special environments, e.g. potentially fire-risk/explosive environment, it is necessary to consult it with the person responsible for health and safety.
- It is unacceptable to operate the device when:
 - ⇒ it is damaged and completely or partially out of order,
 - ⇒ its cords and cables have damaged insulation,
 - ⇒ it has been stored for an excessive period of time in disadvantageous conditions (e.g. excessive humidity). If the device has been transferred from a cool to a warm environment with a high level of relative humidity, do not start measurements until the device is warmed up to the ambient temperature (approximately 30 minutes).
- Do not leave unconnected conductor, while the other is connected to the tested network.
- Do not leave unattended device connected to the tested circuit.
- Do not operate the transmitter with open or incorrectly closed battery compartment and do not power it from other sources than those specified in this manual.
- Repairs may be performed only by an authorised service point.



WARNING

Disconnecting the protective conductor is a life hazard for the staff tracing the wires and also for bystanders. Wherever possible you must first disconnect the supply voltage and the phase cable(s). Be particularly careful when removing the protective conductor or the grounding of neutral wire from the system, which must be energized. Ensure that there are no bystanders in the danger area. When the tracing is completed, the connection of the protective conductor or grounding of the neutral conductor **MUST be reconnected.**



NOTE!

The LKN-2500 transmitter is not intended for direct operation under voltage.



Due to continuous development of the device, its features described in this manual may differ from the actual state.

2 Quick start

1

LKD



Attach the holder to the **LKD-2500**.

2

LKD



Turn on the **LKD-2500**.

3

LKZ Mobile



Pair the **Sonel LKZ Mobile** application with LKD-2500. Enter routing settings.

4

LKN



Turn on the **LKN-2500**. Enter the settings for the transmitted signal.

5

LKN



Pair the **LKN-2500** with the tested object. Start transmitting the signal.

6



Perform routing with the **LKD-2500** detector. Observe the readings in the **Sonel LKZ Mobile** application.

7

3 s



Turn off all devices.

3 Description of the system

3.1 Main features of the system

- Working with energized or non-energized objects.
- Work in passive and active mode.
- 3 methods of active work.
- Detection of cables and infrastructure in the ground.
- Cable and infrastructure routing.
- Recording the route of the routed object.
- Sharing route files with other users of the Sonel LKZ Mobile application.

3.2 Principle of system operation

LKZ-2500 is a system consisting of:

- LKN-2500 transmitter,
- LKD-2500 detector,
- Sonel LKZ Mobile application,
- other necessary accessories.

LKN-2500 transmitter injects a locating signal into an underground object. **LKD-2500 detector** placed along the object traces this signal along the object. The information about position of the traced object is displayed on the **Sonel LKZ Mobile app** which is connected with the detector. Determination of the object's route is possible based on observation of compass readings and the level of the detected signal.

The system has the ability to trace cables and record routes via the mobile application. Such files can be exported and shared with other users – including those who do not have the LKN-2500 / LKD-2500 device.

The system is capable of operating in passive mode (without the use of the LKN-2500 transmitter) and active mode (with the use of the LKN-2500 transmitter). The active mode allows to introduce the signal in three different methods:

- **galvanic** – injects tracing signal into the object directly, through crocodile clips and test leads,
- **clamp** – injects tracing signal into the object through an inductive clamp,
- **inductive** – injects tracing signal into the object inductively, using the instrument's internal antenna.

3.3 Transmitter LKN-2500

3.3.1 Buttons on the housing



- Turn on the device (press briefly)
- Turn off the device (press and hold)



Method of displaying parameters of the transmitted signal: amperes / volts / watts / resistance



Start/stop signal transmission



Increase the signal strength



Decrease the signal strength

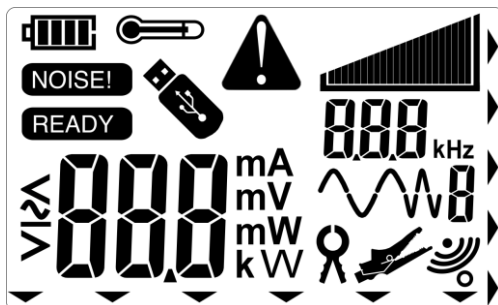














Select the signal frequency



Set the method of connecting the transmitter to the routed object

3.3.2 Display





| | |
|---|---|
|  | Charging the battery |
| NOISE! | Interference detected in the connected object |
| READY | The device is ready to transmit a signal |
|  | Warning: the meter temperature is higher than permissible |
|  | USB memory connected to the instrument |
|  | Error/warning/information |
|  | Strength of the transmitted signal. |
|  | Strength of the transmitted signal. |
|  | The frequency of the transmitted signal |
|  | Shape of the transmitted signal. |
|  | Inputting a signal into an object: clamp method |
|  | Inputting a signal into an object: galvanic method |
|  | Inputting a signal into an object: induction method |
|  | Indicates a button on the instrument housing |

3.3.3 Time settings for automatic shutdown (auto-off)

1



Press and hold down  button to turn on the meter. Release  only when the settings screen appears.

2



Enter the time after which the device will automatically turn off.

3



Confirm the settings with the **START/STOP** button.

3.4 LKD-2500 Detector

3.4.1 Buttons on the housing



- Turn on the device (press and hold)
- Turn off the device (press and hold)

3.4.2 Handles



LKD-2500 with a long handle installed



LKD-2500 with a short handle installed

3.5 Sonel LKZ Mobile application

The application works with Sonel LKD-2500 detector. It enables tracing of objects, recording of routes in the memory of the mobile device along with GPS positions of waypoints and additional readings.

The application additionally enables:

- live positioning preview,
- measuring the distance to a specific waypoint,
- export of routes to other mobile devices,
- reading routes from the mobile device's memory,
- preview of all recorded parameters,
- merging routes,
- adding notes to routes and measurement points.

3.5.1 Gestures



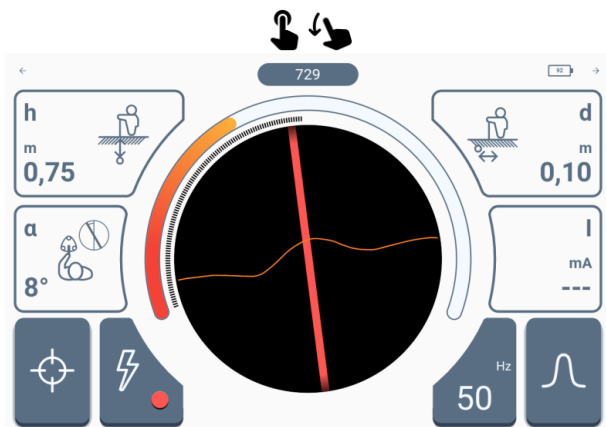
Drag your finger across the touchscreen



Touch an item on the touch screen

3.5.2 Menu icons

Expand your mobile device's settings menu



Expand the checkpoint menu

General



Go to the previous window



Go to the next window



Expand the item



Collapse the item



Return to the main menu



Close window / cancel the action



Save



Refresh



Information

Menu



Left/expand



Right/expand

Status menu

55

Battery charge level in LKD-2500

Checkpoint menu



Delete checkpoint

Save

Save the list of checkpoints

Memory



Add an object



Search



Add a folder



Go to the parent folder



Add a routed object

Function panel



Save the waypoint to the mobile application memory



Detector operating mode



Power



Radio



Signal



Frequency of the searched signal (different signals available depending on the operating mode)



Method of signal reception



Narrow



Wide



Selective

3.5.3 Measurements



The icon is displayed when the application is paired with the LKD-2500 detector. It takes user to the routing screen.

3.5.4 Bluetooth



Displays a list of available LKD-2500 detectors.

3.5.5 Settings



Here you can configure the app to your needs.

3.5.5.1 Information



Here you can check information about the app.

3.5.5.2 App settings



Available settings:

- **ID auto increment** – creating new objects in the parent folder with a unique route ID within the existing numbering.
- **Name auto increment** – creating new names for memory elements according to previously entered names and types.
- **Imperial distance unit** – setting distance units.
- **Detector sound** – here you can turn on / off system sounds.
- **Signal chart** – here you can turn on / off RSSI characteristics.

3.5.6 Creating a memory structure

1



Select icon **Folders**.

2



Add a folder.

3



Enter the object details.

4



Save Changes.

5

Enter the created folder and:









add a lower-level folder (and enter its data),



add the routed object (and enter its data).

4 Pairing devices

- 
 Turn on **LKD-2500** detector.
-  Turn on **Sonel LKZ Mobile** application.
-  Select the **Bluetooth** icon.
-  Connect to the **LKD-2500** detector.
-  Close the pairing window.



When communication between the LKD-2500 and the Sonel LKZ Mobile application is lost and not restored within 5 minutes, the LKD-2500 will automatically turn off.



Additional information displayed by the device



LKD without battery charging

LKD in battery charging mode



LKD switched off



LKD switched on



Synchronization with the Sonel LKZ Mobile application is in progress.

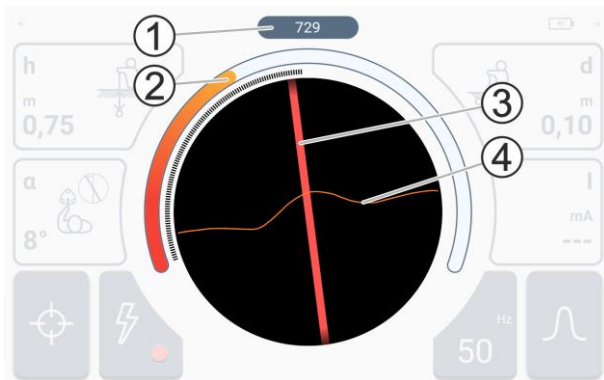
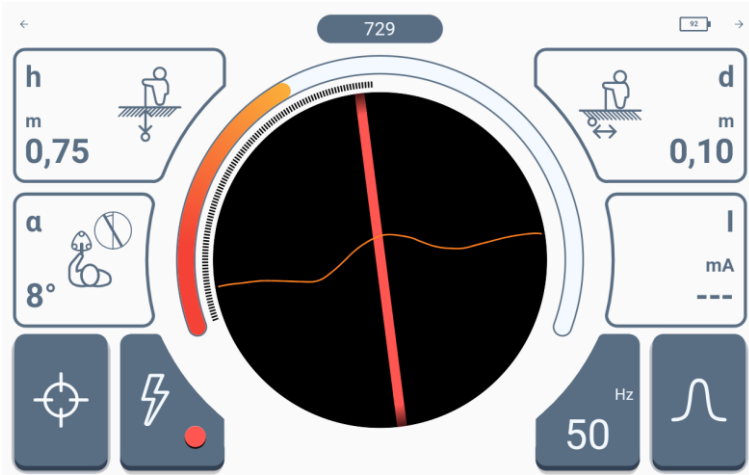


Connection to the Sonel LKZ Mobile application established.

5 Routing

5.1 Routing screen of the Sonel LKZ Mobile application

Routing screen of the Sonel LKZ Mobile application is shown below.

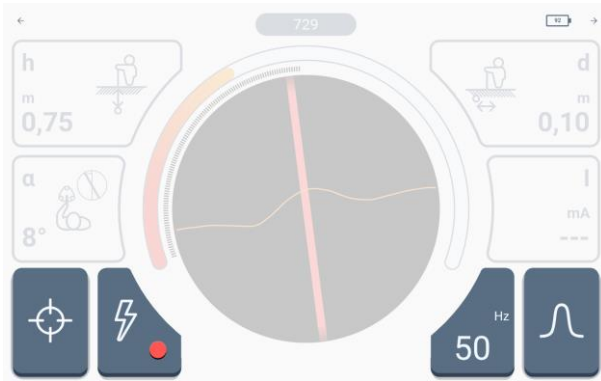


In the central part there is a compass with a route preview.

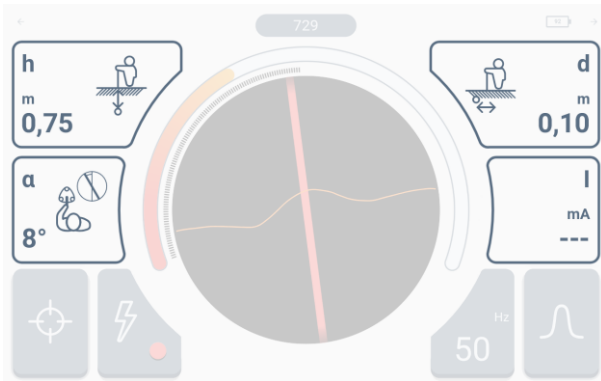
- 1 – received signal strength.
- 2 – graph of the received signal strength.
- 3 – course of the routed object relative to the detector axis.
- 4 – RSSI characteristics.



- The area presented on the compass corresponds to the area around the LKD-2500 detector with a diameter of 2 meters.
- When the signal is strong enough, an arrow pointing towards it is displayed to direct the user to it.
- When line 3 turns grey, it means that the algorithm assesses that the signal does not meet the correctness conditions, which means that:
 - the displayed line is an approximation of the position of the traced object (the indications are stable) or
 - the detector has detected interference (indications are unstable).



In the upper and lower parts there are controls and settings icons described in **sec. 3.5.2**.



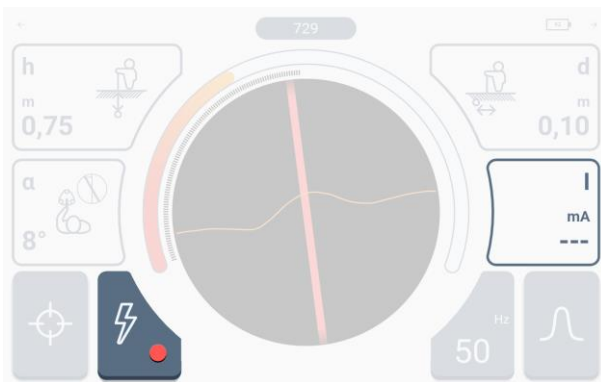
There is a set of indications on the sides.

h – depth of the routed object relative to the detector, expressed in meters.

α – angle of deviation of the routed object relative to the detector axis, expressed in degrees.

d – distance of the routed object from the detector, expressed in meters.

There is an **additional reading field** in the lower right corner.



The indications of this field depend on the active routing mode.

- **Power** mode – dashes are displayed (no reading).
- **Radio** mode – the currently detected leading frequency of the signal flowing through the routed object is displayed.
- **Signal** mode – the signal current flowing through the routed object is displayed.

5.2 Methods of signal reception

The LKZ-2500 system can receive the signal in three different ways.



Narrow. This characteristic is used to precisely determine the location of the signal and for accurate routing. When it is active, an algorithm determines whether the conditions for the correctness of the tracked signal are met

- If the algorithm conditions are met, the line on the radar is coloured according to the set routing mode.
- If the algorithm conditions are not met, the received signals are still presented, but as a grey line.



Wide. This characteristic is used to find the signal and to map the area. When it is active, an algorithm determines whether the conditions for the correctness of the tracked signal are met.

- If the algorithm conditions are met, the line on the radar is coloured according to the set routing mode.
- If the algorithm conditions are not met, the received signals are still presented, but as a grey line.



Selective. This characteristic is used to identify received signals and to route very low strength signals (the intensity of the audio signal decreases). When it is active, the radar displays only signals that meet the criteria of the algorithm, which determines the fulfilment of the correctness of the tracked signal.

5.3 Routing modes

5.3.1 Operation in passive mode - Power

Operation in the **Power** passive mode involves locating of objects carrying own signals with a power frequency of 50 Hz or 60 Hz. This means that such routing can only take place over active powered facilities. In this mode, **using the LKN-2500 transmitter** to force a signal in the object **is not necessary**. This results in faster preparation for location and routing and no need to disconnect the facility from power supply or interfere with its structure.

1



Select **Power** mode.

2



Select the frequency of the signal searched in the routed object.

3



Select the method of signal reception.

4

Place the LKD-2500 detector over the object to be traced.

- When you start getting closer to the object, you will notice an increase in the strength of the received signal on the bargraph and numerical indicator.
- When you are directly above an object or in its immediate vicinity, you will see a line on the screen showing its course.

5



Now you just need to follow its route according to the indications.

6



If necessary, change the way of receiving the signal.

5.3.2 Operation in passive mode – Radio

Operation in the **Radio** passive mode involves locating of objects carrying own signals or signals induced at frequencies from 2.5 kHz to 52 kHz. This means that such routing can take place over all active or inactive objects that carry signals with a frequency within the measurement range. In this mode, **using the LKN-2500 transmitter to force a signal in the object is not necessary**. This results in faster preparation for location and routing and enables the location of various types of infrastructure, not necessarily electricity - also telecommunications or simply conductive.

1



Select **Radio** mode.

2



Select the frequency of the signal searched in the routed object.

3



Select the method of signal reception.

4

Place the LKD-2500 detector over the object to be traced.

- When you start getting closer to the object, you will notice an increase in the strength of the received signal on the bargraph and numerical indicator.
- When you are directly above an object or in its immediate vicinity, you will see a line on the screen showing its course.

5



Follow the route of the object as indicated.

6



If necessary, change the way of receiving the signal.

5.3.3 Working in active mode – Signal

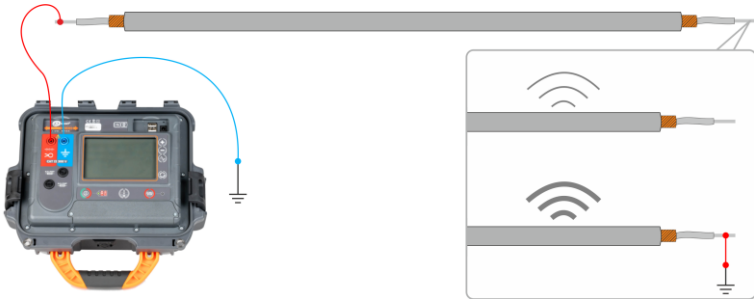
Working in the **Signal** active mode involves precise locating of objects capable of transmitting signals. This means that such routing can take place over all active or inactive objects capable of carrying signals. In this mode **using the LKN-2500 transmitter** to force a signal in the object **is necessary**.

5.3.3.1 Methods of introducing a signal to the routed object

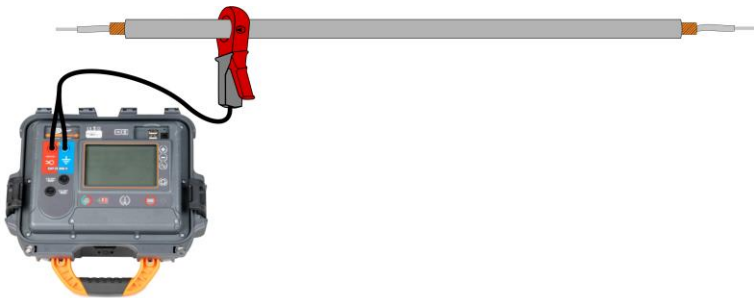
- **Galvanic method** – involves introducing a signal into the object galvanically, i.e. via wires. The wires are connected to the transmitter, the ground electrode and the object being routed. The galvanic method ensures the best introduction of the generated signal to the object and, consequently, the most effective location and routing.



- The routed object **must be out inactive**, i.e. de-energized.
- To improve the strength of the transmitted signal, ground the end of the routed object.



- **Clamp method** – involves introducing a signal to the object inductively using clamps. The clamps are connected to the transmitter and attached to the routed object.










The tested object **can be live**.

- **Inductive method** – involves introducing a signal to the object inductively using internal antenna of the transmitter. The device is placed over the object **as directed by the arrow on the housing**. The signal is induced in all objects located under the transmitter, so it will be possible to locate more objects located underground. The strength of the signal generated in the object depends in this case on the depth at which the object is located, as well as on the type of ground and the presence of other conductive infrastructure.



The tested object **can be live**.

5.3.3.2 Introducing signal

-  In the **LKN-2500** set the method of introducing the signal (galvanic / clamp / inductive) to the routed object.
-  Connect the signal forcing circuit.
-  Select the shape and the frequency of the transmitted signal
-  Set the signal strength.
 In the induction method, the signal strength is locked at the maximum level.
-  Press **START/STOP** to start transmitting the signal.
-  When necessary, change the method of displaying parameters of the transmitted signal: amperes / volts / watts / resistance



Additional information displayed by the device



Voltage on the object ≥ 5 V. Signal transmission is blocked. Disconnect the voltage from the object.



Voltage on the object ≥ 50 V. Signal transmission is blocked. Disconnect the voltage from the object.



The temperature of the device is higher than permissible.



The device was previously turned off because the Auto OFF time elapsed.



The previous shutdown of the device occurred due to battery discharge.

5.3.3.3 Routing

1



In **Sonel LKZ Mobile** app, select **Signal** operating mode.

2



Select the frequency of the signal that the LKN-2500 introduces to the routed object.

3



Select the method of signal reception.

4

Place the LKD-2500 detector over the object to be traced.

- When you start getting closer to the object, you will notice an increase in the strength of the received signal on the bargraph and numerical indicator.
- When you are directly above an object or in its immediate vicinity, you will see a line on the screen showing its course.

5



Follow the route of the object as indicated.

6



If necessary, change the way of receiving the signal.

5.4 Route registration

1



Pair the **Sonel LKZ Mobile** application with LKD-2500 detector.

2



In the main menu, select **Measurements**.

3



Select operation mode.

4



Select the frequency of the signal that the LKN-2500 introduces to the routed object.

5



Follow the route of the object as indicated.



This icon will save the GPS location of the route point along with all its data to the application memory.



After expanding **the checkpoint menu**, a list of saved points will appear.

6



If necessary, select a checkpoint. It will expand to the form below.

1 – checkpoint number in the series

/ / – detector operating mode: Power / Radio / Signal.

h – depth of the routed object relative to the detector, expressed in meters.

α – angle of deviation of the routed object relative to the detector axis, expressed in degrees.

d – distance of the routed object from the detector, expressed in meters.

f – frequency:

⇒ frequency of the signal sought (only in Signal mode),

⇒ leading frequency of the signal sought (only in Radio mode),

I – signal current flowing through the routed object, expressed in milliamps (only in Signal mode).

– GPS location of the checkpoint

– time of saving the checkpoint

– date of saving the checkpoint

Add comment – field for adding a comment

Use icon to remove a checkpoint.

7



Finally, expand the **checkpoint menu** and save the results to an object in the app memory – the **Save** command in the top bar.

5.5 Restoring the route

1

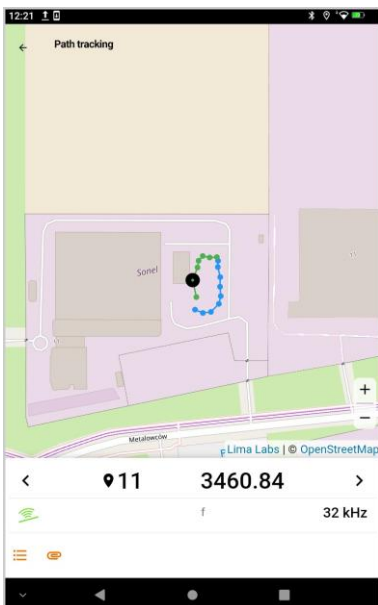



In the main menu, select **Folders**.




2




Go to the routed object. A map will appear with a route marked by the saved checkpoints.



 1 – checkpoint number in the series

 /  /  – detector operating mode: Power / Radio / Signal.

f – frequency of the signal sought (only in Signal mode).

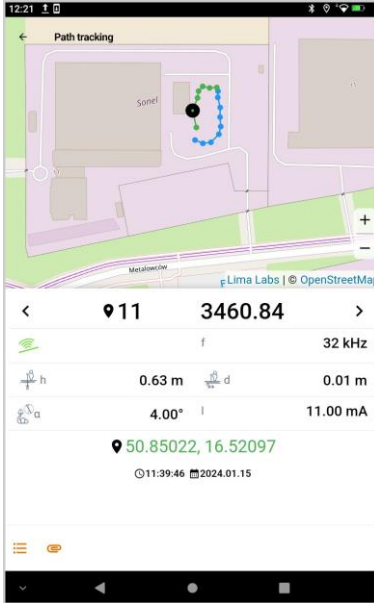
 – the icon expands the list of all saved route points.

 – adding a note.

3



Swipe up from the bottom of the values area to view the signal parameters at the control point.



h – depth of the routed object relative to the detector, expressed in meters.

α – angle of deviation of the routed object relative to the detector axis, expressed in degrees.


d – distance of the routed object from the LKD detector, expressed in meters.

f – frequency:

⇒ frequency of the signal sought (only in Signal mode),

⇒ leading frequency of the signal sought (only in Radio mode),

I – signal current flowing through the routed object, expressed in milliamps (only in Signal mode).

 – GPS location of the checkpoint.

 – time of saving the checkpoint.

 – date of saving the checkpoint.




In order for the map of the route area to be loaded, the mobile device must have Internet access.


6 Software update

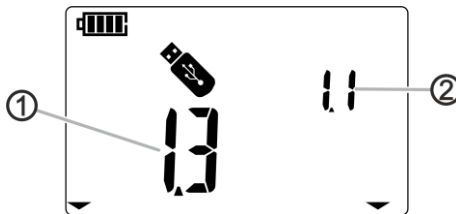
6.1 LKN-2500 transmitter

1 Download the update file from the manufacturer's website.


2 Save the update file to a USB stick. The memory must have the FAT32 file system.

3  Turn on the LKN-2500.

4  Insert the USB stick into the upper USB port of the LKN-2500. The installed and latest available software version will be displayed on the screen.



1 – software version on the USB memory stick
2 – software version installed in the device


5  If the version on the USB stick is higher than the installed version, press **START/STOP** to update.

6 After a successful update, the instrument will return to the transmitting screen.





6.2 LKD-2500 detector

1 Download the update file from the manufacturer's website to the mobile device.

2 Turn on **Sonel LKZ Mobile** application.

3  Turn on the LKD-2500.

4 Using the mobile application, pair it with the device.

5 


 Go to **Settings ► Update** and select the update file. A message verifying the correctness of the file will be displayed on the screen. Then confirm the update.

6 A progress bar will appear on the screen. After successful update, the application will display the main menu.

7 Troubleshooting













Before sending the instrument for repairs, contact our service department. It maybe possible that the meter is not damaged, and the problem has been caused by some other reasons.






The meter can only be repaired at outlets authorized by the manufacturer.

Troubleshooting of typical problems during the use of the instrument is described in the table below.

7.1 LKN-2500 transmitter

7.1.1 Error codes

| Error code | Cause | Action |
|---|--|---|
|  1 | Voltage present on tested object ≥ 50 V. | Disconnect the voltage from the object. |
|  1 | Too high or too low supply voltage to the galvanic actuator – damaged internal power module. | |
|  2 | Reference voltage error. | |
|  3 | Relay switching error. | |
|  4 | Relay switching error. | |
|  5 | Relay switching error. | |
|  6 | Calibration coefficients checksum error. | Contact the customer service centre and provide the error code to get help. |
|  7 | Galvanic transmitter on/off error. | |
|  8 | Inductive transmitter on/off error. | |
|  9 | Relay switching error. | |
|  10 | Relay switching error. | |
|  11 | Relay switching error. | |

| Error code | Cause | Action |
|--|---|---|
|  CHG | Charging error. Charging cancelled. | Contact the customer service centre and provide the error code to get help. |
|  -t- | The temperature of the device is higher than permissible. | Turn off the device, wait 10 minutes, turn the device on and check if the error persists. If yes, contact the customer service centre and provide the error code to get help. |
|  FUS | Blown fuse. | Replace the fuse. |
|  Aut | The device was previously turned off because the Auto OFF time elapsed. | Turn the meter off and on. |
|  bAt | The previous shutdown of the device occurred from battery discharge. | Charge the battery |

7.1.2 Fuse replacement

The device is protected by two fast-acting fuses 5 x 20 mm 0.5 A / 250 V AC. To replace the fuse, unscrew the socket head, place a working fuse in place of the damaged fuse, and then screw on the socket head.



NOTE!

Do not use fuses other than those listed in this manual.

8 Power supply



NOTE!

Before operating the meter, discharge the battery and then fully charge it, so that the indication of its charged status is correct.

8.1 Battery power

The meter is powered by a lithium-ion battery. The meter is charged by a USB power supply. It can be also charged from the car 12 V accessory socket, using an optional converter.

The charge level of the rechargeable battery is indicated by the symbol in the display on a permanent basis

8.1.1 LKN-2500 transmitter



Battery charge <100%.



Battery charge $\leq 37\%$.



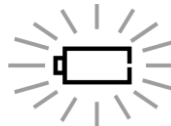
Battery charge $\leq 87\%$.



Battery charge $\leq 12\%$.



Battery charge $\leq 62\%$.



Battery charge $\leq 5\%$.



Additional information displayed by the device



Aut

The device was previously turned off because the Auto OFF time elapsed.



bAt

The previous shutdown of the device occurred from battery discharge.

8.1.2 LKD-2500 detector

The battery charge level of the device is indicated in the Sonel LKZ Mobile application.



Battery charge in %.



When communication between the LKD-2500 and the Sonel LKZ Mobile application is lost and not restored within 5 minutes, the LKD-2500 will automatically turn off.

8.2 Charging rechargeable battery

8.2.1 LKN-2500 transmitter



NOTE!

- While the device is charging, **do not turn it on or off**. This may damage it. It is only allowed to charge the device when it is turned on or off.
- Do not power the device from sources other than those listed in this manual.

Charging starts once the power supply has been connected to the device, regardless of the fact whether the device is on or off. The charging status is indicated by active LED.

Charging with:

- a charger,
- the car cigarette lighter socket, using an optional converter.

Indication of completed charging:



Additional information displayed by the device



CHG

Charging error. Charging cancelled.



The temperature of the device is higher than permissible.

8.2.2 LKD-2500 detector



NOTE!

Do not power the device from sources other than those listed in this manual.

Charging starts once the power supply has been connected to the device, regardless of the fact whether the device is on or off and whether it operates or not. The charging status is indicated by active LED.

Charging with:

- a charger
- power bank,
- the car cigarette lighter socket, using an optional converter.
- computer USB port,
- via the USB-A / USB-C adapter.

When the device is turned off by button, the charging process is not stopped.

Signalling of completed charging: (signalling in the Sonel LKZ Mobile application).

8.3 Power supply from mains

It is possible to charge the battery of LKD-2500 when carrying out the measurements. To do this, simply connect the power supply to the device.





8.4 General rules for using Li-Ion rechargeable batteries

- Store the meter with batteries charged at least to 50%. The battery pack may be damaged if stored when fully discharged. The ambient temperature for prolonged storage should be maintained within the range of 5°C...25°C. The environment should be dry and well ventilated. Protect the device from direct sunlight.
- Charge the batteries in a cool, well-ventilated place at a temperature of 10°C ... 28°C. Modern fast chargers detect both too low and too high temperature of rechargeable batteries and react to the situation adequately. When the temperature is too low, charging is prevented as it may irreparably damage the batteries.
- Do not charge or use the batteries in extreme temperatures. Extreme temperatures reduce the lifetime of rechargeable batteries. Always observe the rated operating temperature. Do not dispose of the battery pack into fire.
- Li-Ion cells are sensitive to mechanical damage. This kind of damage may cause its permanent damage and thus cause ignition or explosion. Any interference in the structure of Li-Ion battery pack may cause its damage. This may result in its ignition or explosion. A short-circuit of the battery poles "+" and "-" may permanently damage the battery pack or even cause its fire or explosion.
- Do not immerse Li-Ion battery in liquids and do not store in humid conditions.
- If the electrolyte contained in the Lithium-Ion battery pack comes into contact with eyes or skin, immediately rinse the affected area with plenty of water and consult with a doctor. Protect the battery against unauthorised persons and children.
- When you notice any changes in the Lithium-Ion battery pack (e.g. changes in colour, swelling, excessive temperature), stop using the battery pack. Li-Ion batteries that are mechanically damaged, overcharged or excessively discharged are not suitable for use.
- Any misuse of the battery may cause its permanent damage. This may result in its ignition. The seller and the manufacturer shall not be liable for any damages resulting from improper handling of the Li-Ion battery pack.

9 Status signalling








9.1 LKN-2500 transmitter



-  LKN-2500 turned off.
-  LKN-2500 turned off, battery is charging.
-  LKN-2500 turned on, the charger disconnected.
-  LKN-2500 turned on, battery is charging.

9.2 LKD-2500 detector



-  LKD-2500 turned off, the charger disconnected.
-  LKD-2500 turned off, battery is charging.
-  LKD-2500 turned on, the charger disconnected.
-  LKD-2500 turned on, the charger disconnected. (Synchronization with the Sonel LKZ Mobile application is in progress.)
-  LKD-2500 turned on, battery is charging. (Synchronization with the Sonel LKZ Mobile application is in progress.)
-  LKD turned on, the charger disconnected, connection to the Sonel LKZ Mobile application established.
-  LKD turned on, battery is charging, connection to the Sonel LKZ Mobile application established.

10 Cleaning and maintenance



NOTE!

Use only the maintenance methods specified by the manufacturer in this manual.

The casing of the device may be cleaned with a soft, damp cloth using all-purpose detergents. Do not use any solvents or cleaning agents which might damage the casing (powders, pastes, etc.).

Clean the probe with water and dry it.

The test leads should be cleaned with water and detergents, and then dried.

The electronic system of the meter does not require maintenance.

11 Storage

In the case of storage of the device, the following recommendations must be observed:

- disconnect all the test leads from the meter,
- clean the meter and all its accessories thoroughly,
- wind the test leads.

12 Dismantling and utilisation

Worn-out electric and electronic equipment should be gathered selectively, i.e. it must not be placed with waste of another kind.

Worn-out electronic equipment should be sent to a collection point in accordance with the regulations valid in a given region.

Before the equipment is sent to a collection point, do not dismantle any elements.

Observe local regulations concerning disposal of packages, waste batteries and rechargeable batteries.

13 Technical data

13.1 LKN-2500 transmitter

The device does not have the character of a standard and therefore is not subject to calibration. The proper form of control for this type of instrument is checking.

Features

- Voltage measurement
- Resistance measurement
- Power measurement
- Current measurement
- The ability to work with live cables (clamp and inductive method)
- Battery level indication

Operating data

- a) type of insulation acc. to EN 61010-1 and EN IEC 61557 double
- b) measurement category acc. to EN 61010-1 CAT II 300 V
- c) ingress protection acc. to EN 60529
 - with open housing IP40
 - with closed housing IP67
- d) power supply
 - rechargeable battery Li-Ion 7.2 V 9.8 Ah
 - operating time when powered by a battery max. 16 h
 - charging temperature 0°C...45°C
- e) transmission power
 - galvanic method max. 3.6 W
 - induction method max. 84 VA
- f) dimensions 318 x 257 x 152 mm
- g) weight 3.4 kg
- h) operating temperature -10...+50°C
- i) storage temperature -20...+60°C
- j) reference temperature +23 ± 2°C
- k) altitude a.s.l. ≤2000 m
- l) auto-off function 0.5 h...9.5 h
- m) quality standard development, design and manufacturing are ISO 9001 compliant
- n) the product meets EMC requirements (immunity for industrial environment) according to the following standards EN 61326-1, EN 61326-2-2

13.2 LKD-2500 detector

The device does not have the character of a standard and therefore is not subject to calibration. The proper form of control for this type of instrument is checking.

Features

- 4-stage signal filtering
- Signal detection at the indicated azimuth
- Offset measurement (the compass covers area of 2-metre diameter around the LKD-2500)
- Measurement of angle of deviation of the routed object relative to the detector axis
- Measurement of the signal current flowing through the routed object
- Battery level indication
- With Sonel LKZ Mobile – indication of the currently detected signal leading frequency
- With Sonel LKZ Mobile – acoustic and visual detection indication (360° line direction indicator)
- With Sonel LKZ Mobile – RSSI characteristics
- With Sonel LKZ Mobile – indication of the received signal strength (bar graph and numerical value)
- With Sonel LKZ Mobile – metric or imperial units

Depth measurement accuracy

⇒ The abbreviation "m.v." used in the specification of accuracy denotes a measured value

| Depth \ Mode | Power | Radio | Signal (8 kHz) | Signal (32 kHz) |
|--------------|-------------|----------|----------------|-----------------|
| ≤1 m | 10% m.v. | 10% m.v. | 5% m.v. | 2.5% m.v. |
| ≤4 m | | | 10% m.v. | 10% m.v. |
| ≤6 m | unspecified | | | |

- The depth of the cable should be measured parallel to and directly above the cable route.
- Accuracy is correlated with the current that can be forced in the object (defined reference conditions).

Operating data

- a) type of insulation acc. to EN 60529.....IP65
- b) power supply
- rechargeable battery..... Li-Ion 3.6 V 6.7 Ah
 - operating time when powered by a battery max. 13 h
 - charging interfaceUSB-C 5 V / 3 A
 - charging timemax 4 hours
 - charging temperature+10°C...45°C
- a) dimensions 290 x 275 x 100 mm
- b) weight 1,2 kg
- c) operating temperature..... -10°C...+50°C
- d) storage temperature-20°C...+60°C
- e) reference temperature.....+23°C±2°C
- f) operating humidity20%..90%
- g) reference humidity40%...60%
- h) data transmission
- wireless communication standardBluetooth 5.0 BLE
 - communication range up to 50 m in open space
- i) Auto-Off when communication between the LKD-2500 and the Sonel LKZ Mobile application is lost..... 5 min
- j) altitude a.s.l. ≤2000 m
- k) quality standarddevelopment, design and manufacturing are ISO 9001 compliant
- l) the product meets EMC requirements (immunity for industrial environment) according to the following standards EN 61326-1, EN 61326-2-2

14 Manufacturer

The manufacturer of the device and provider of guarantee and post-guarantee service:

SONEL S.A.
Wokulskiego 11
58-100 Świdnica
Poland
tel. +48 74 884 10 53 (Customer Service)
e-mail: customerservice@sonel.com
web page: www.sonel.com



NOTE!

Service repairs must be performed only by the manufacturer.

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SONEL S.A.

Wokulskiego 11
58-100 Świdnica
Poland

Customer Service

tel. +48 74 884 10 53
e-mail: customerservice@sonel.com

www.sonel.com