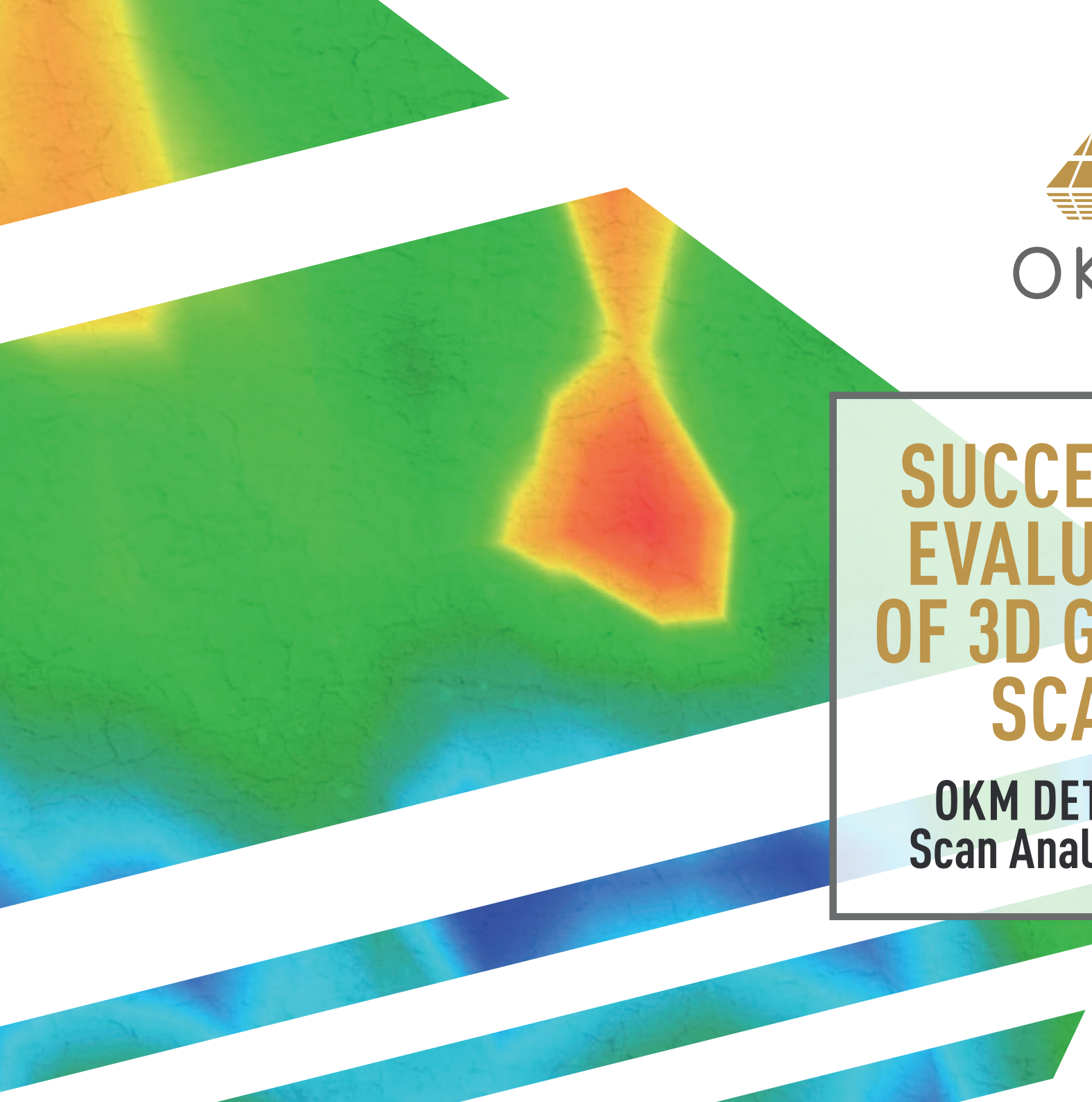


OKM

SUCCESSFUL EVALUATION OF 3D GROUND SCANS

OKM DETECTORS
Scan Analysis Guide

English
Version 1.0 | February 2026

NOTICE

The search for historical and archaeological artifacts and structures may be regulated in different ways from state to state. Searching with a detector may require approvals and permissions from landowners, public agencies and/or government authorities.
With the purchase of the OKM detector you DO NOT automatically receive a detection permit or excavation permit! Consult the authorities responsible for your search project and/or area for information on required permits.

DISCLAIMER

The detectors referred to in this guide have been specifically designed and manufactured as a high-quality ground scanner and is recommended for treasure hunting in non-hazardous environments. These detectors have not been designed as mine detectors.

OKM GmbH
Julius-Zinkeisen-Str. 7
04600 Altenburg
Germany

Phone: +49 3447 499 300 0
Website: www.okmdetectors.com

TABLE OF CONTENTS

1 INTRODUCTION

Many users ask what their scan images actually show. A successful scan analysis does not only depend on correctly interpreting the scan image, but also on creating a high-quality scan image in the first place. Both aspects are closely connected and equally important.

The purpose of this **SCAN ANALYSIS GUIDE** is to show you how to

- identify anomalies,
- correctly interpret subsurface structures,
- and avoid misinterpretations.

A well-performed analysis helps distinguish relevant target signals from soil effects or interferences, and supports informed decisions before excavation.

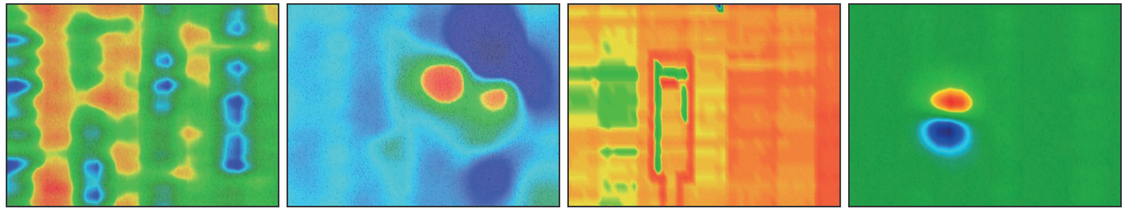
For an efficient scan analysis that is quick, structured, and reliable, good scan data is essential. For this reason, the first four chapters of this guide – including this *Introduction* – provide an overview of the **KEY FACTORS THAT INFLUENCE SCAN QUALITY** and explain what is required to produce reliable scans as a foundation for meaningful analysis.

The scan result is influenced by

1. **EXTERNAL CONDITIONS** such as soil conditions, weather and moisture, but also interferences from power lines, vehicles, buildings, walls, fences, or reinforced concrete.
2. **TECHNICAL FACTORS** are determined by how the scan is performed and include scan consistency as well as software or device settings.
3. **MAGNETIC INFLUENCES** near the sensors, such as keys, smartphones, tools, or metal accessories, can also distort scan results and must be avoided.
4. The selection of the **APPROPRIATE MODES** is also crucial: This guide focuses primarily on magnetic field measurement with 3D Ground Scan, as it is the most commonly used operating mode for locating buried objects, artifacts and structures. Moreover, different scan modes and impulse modes are designed for different scan field conditions.

The final two chapters focus on practical scan analysis: Chapter 5 presents five simple steps for using *Visualizer 3D Studio* efficiently to perform a fast and structured scan analysis. Chapter 6 explains how to interpret the colors and structures of detected signals in order to evaluate scan results correctly and draw conclusions for further steps.

By understanding the influences and applying the guidelines in this document, users will be equipped to produce high-quality scans and perform reliable scan analyses.



OKM

CHECKLIST: KEY FACTORS

1 ENVIRONMENTAL CONDITIONS

- ☐ Know the **SOIL TYPE** and mineralization.
- ☐ Consider **MOISTURE** and weather conditions.
- ☐ Be aware of **DISTURBANCES** from power lines, vehicles, buildings, etc.
- ☐ Eliminate or maintain distance to **OTHER SOURCES OF INTERFERENCE**.

2 SCANNING TECHNIQUE

- ☐ Ensure correct **SCAN DIRECTION**.
- ☐ Maintain steady walking **SPEED**.
- ☐ Keep consistent **PROBE HEIGHT**.
- ☐ Guarantee equal **SCAN LINE SPACING**.
- ☐ Provide sufficient **IMPULSE DENSITY**.

3 MAGNETIC INFLUENCES NEAR THE SENSORS

- ☐ Remove **KEYS** and coins from pockets.
- ☐ Keep the sensors away from **SMARTPHONE** and **SMARTWATCH**.
- ☐ Maintain distance to **FERROMAGNETIC TOOLS AND ACCESSORIES**.
- ☐ Avoid **METAL ACCESSORIES**, such as buckles and jewelry.
- ☐ Keep the sensors away from **SHOES** with metal components, steel-toe work boots.

4 CORRECT MODE SELECTION

- ☐ Use **OPERATING MODE** 3D Ground Scan.
- ☐ Select **SCAN MODE** *Parallel* (preferred) or *Zigzag*.
- ☐ Choose **IMPULSE MODE** *Automatic* or *Manual*.

2 PREPARATION: CREATING THE RIGHT CONDITIONS FOR RELIABLE SCANS

Successful 3D ground scanning starts long before the first measurement is performed. Careful preparation of the target area and scan field is essential to obtain reliable and interpretable results. By defining the target and the scan field, removing obstacles and surface scrap metal, and accounting for environmental influences, you minimize interferences and prevent valuable signals from being distorted or masked. **A well-prepared scan field improves depth performance, signal clarity, and reproducibility, for meaningful scan interpretation and confident target evaluation.**

Before conducting any measurements, thorough preparation of the target area is the first step in effective scan analysis. Measuring an area blindly will not produce the expected results. The following four steps help you to create the right conditions for good scans:

1 RESEARCH

WHAT are you looking for?
What material is your target object made of?

WHAT SIZE do you expect the find to be?

WHEN has the target object been buried?

WHERE do you think you might find the target object?

Are there historical indications that **CONFIRM YOUR SUSPICIONS**?

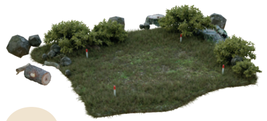
Are the **SCAN FIELD CONDITIONS** favorable?

2 DEFINE

Mark the **4 CORNERS** of the scan field.

Determine the scan field **DIMENSIONS**; at least **5×5 m (16×16 ft)**.

Stake out the area and use ropes to clearly **DEFINE THE SCAN LINES**.



3 REMOVE

Remove **OBSTACLES** such as high grass, bushes, stones, and tree trunks.

Are there **SOURCES OF INTERFERENCE** such as fences, vehicles, walls, power lines, etc. in the immediate vicinity?

If obstacles cannot be removed, consider using the **IMPULSE MODE *MANUAL***.

4 CLEAR

Perform a quick scan by using the operating mode *Magnetometer*, *Live Sound*, *Pinpointer* or *Live Scan*, if available.

Remove any **SMALL FERROUS OBJECTS NEAR THE SURFACE** from the target area. This allows the subsequent 3D Ground Scan to deliver more meaningful results.

okm

CHECKLIST: PREPARATION

1 TARGET RESEARCH

- [ ] Know your **TARGET OBJECT**: material, size, shape, depth, time buried.
- [ ] Know your **TARGET AREA**: Review maps and archives, talk to locals.
- [ ] Look for **CLUES**: stone markers, terrain features, vegetation patterns.
- [ ] Check **SCAN FIELD CONDITIONS**: soil type, vegetation, accessibility.

2 FIELD DEMARCATION

- [ ] Mark the **4 CORNERS** of your scan field.
- [ ] Define a scan field of **AT LEAST 5×5 m (16×16 ft)**.
- [ ] Know the exact scan field **DIMENSIONS**.
- [ ] Use ropes or strings to **DEFINE THE SCAN LINES**.

3 OBSTRUCTION REMOVAL

- [ ] Remove **OBSTACLES** like high grass, bushes, stones, tree trunks etc.
- [ ] Consider sources of **INTERFERENCE** such as fences, vehicles etc.
- [ ] Consider using the **IMPULSE MODE *MANUAL*** in rough terrain.

4 SCRAP METAL CLEARING

- [ ] Use *Magnetometer*, *Live Sound*, *Pinpointer* or *Live Scan* (if available) to perform an **INITIAL QUICK SCAN** of the field.
- [ ] Clear the scan field of any **FERROUS ITEMS** close to the surface.

ADDITIONAL TIPS FOR PREPARATION

☐ KNOW THE EXPECTED SIZE OF YOUR TARGET OBJECT

If you are looking for large target structures such as tombs, tunnels, or treasure chests, you can increase the distance between impulses and scan lines. For small objects such as relics, artifacts and jewelry, collect more scan data by reducing the distance between impulses and scan lines.

☐ KNOW THE EXPECTED SHAPE OF YOUR TARGET OBJECT

If you are looking for a sufficient large object, e.g. an aircraft or a bunker, the detected signal in your scan field can have a shape according to your expectations.

If you are searching for an elongated object, scan across it (perpendicular) rather than parallel to it; otherwise, it may remain hidden between the scan lines. Performing control scans rotated by 90° helps ensure that no objects are missed.

☐ KNOW THE EXPECTED DEPTH OF YOUR TARGET OBJECT

To obtain precise depth values, the object must be positioned in the center of the scan image and be surrounded by normal reference values (neutral ground). If the object is located at the edge of the scan image and is not fully visible, an accurate statement about the depth is not possible.

Ideally, there should only be one object in your scan image. Otherwise, several objects in one scan may affect the accuracy of the depth values.

☐ PLAN SUFFICIENT TIME FOR SCANNING

If conditions in the scan field are not optimal (e.g. rough, sloping terrain and/or dense vegetation), using the *Impulse Mode Manual* can be advantageous. However, this requires more time. In addition, to ensure the validity of your scan results, allow time for at least two control scans. This will also help you identify mineralized soil.

☐ PERFORM SCANS OUTDOORS

Always remember that surrounding objects such as fences, walls, reinforcement in walls and ceilings, vehicles, power lines, or further sources of interference will definitely influence the scan results.

2.1 RESEARCH THE TARGET AREA

Research **HISTORICALLY RELEVANT LOCATIONS** and review maps, online resources, and historical archives to better understand the target area. Moreover, speaking with locals, such as park rangers, historians, or longtime residents, can provide valuable insights. Visible clues such as old markers, unusual terrain features, or distinct vegetation patterns may also indicate potential targets.

Before scanning, evaluate the **FIELD CONDITIONS**, including soil type, mineralization, vegetation, and accessibility, to ensure reliable scan data recording. Clearly define your target by determining what you are looking for, the material and expected size of the object and how long it has been buried. Supporting your assumptions with historical evidence will further improve the reliability of your 3D Ground Scans.

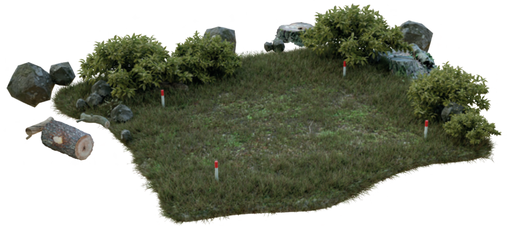
2.2 DEFINE THE SCAN FIELD

Your first measurement in an unknown area should be sufficiently large to obtain representative scan values (e.g. 30 impulses, 10 scan lines). The recommended scan field size for reliable scan results is at least 5×5 m (16×16 ft).

Once you have defined your target area, determine your scan field: Use wooden stakes, for example, to mark the four corners and note the **SCAN FIELD DIMENSIONS**. The more precisely the length and width are defined, the more accurate conclusions can be drawn about the position of potential targets. A clearly staked field also makes it easier to follow the scan lines accurately.

Use accessories if needed: If you are not yet experienced, use ropes or chalk to **MARK THE SCAN LINES** to keep them straight. This ensures equal spacing between the scan lines and helps to locate hidden target objects inbetween.

OKM

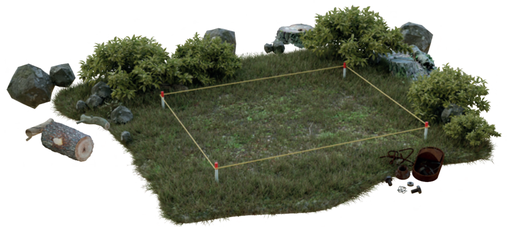


2.3 REMOVE OBSTACLES

Walk across the scan field and **REMOVE MAJOR OBSTACLES** such as tall grass, bushes, stones, and tree trunks. These can prevent you from scanning the lines consistently and may lead to erroneous scan data.

If obstacles cannot be removed, consider using *Impulse Mode Manual*. While it takes more time, it allows you to step over obstacles and still record accurate impulses step by step.

Always keep in mind that **SOURCES OF INTERFERENCE** such as fences, walls, reinforcement in walls or ceilings, vehicles, power lines etc. that usually cannot be removed will definitely influence your scan results. It is important to consider their effects when interpreting the scan data.



2.4 CLEAR THE SCAN FIELD

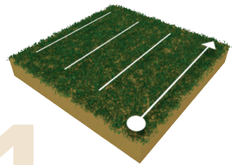
If you do not yet have a precise idea where to start scanning, it is often useful to perform fast scans using the operating mode *Magnetometer, Live Sound* or *Live Scan*, if available. This provides **INITIAL INSIGHTS INTO THE SUBSURFACE**, allowing small objects such as screws, nails, bottle caps, and other ferrous scrap metal to be located and removed directly.

Near-surface scrap metal items can generate very strong signals that may mask potentially interesting objects located deeper underground. By removing such scrap metal, **DEPTH PERFORMANCE** can be significantly increased, allowing deeper targets to be detected more clearly.

3 MEASUREMENT: PERFORMING SCANS WITH TECHNIQUE

During the measurement, the detector operator plays a decisive role in achieving good results. Two factors are particularly important: **PROBE HANDLING** and **WALKING TECHNIQUE**. By applying these tips consistently and with some practice, scans become highly repeatable, making signal verification significantly easier.

High measurement accuracy is essential for achieving high-resolution scan images, as consistent scan direction, spacing, speed, and impulse density directly determine the level of detail and reliability of the results.



1 DIRECTION

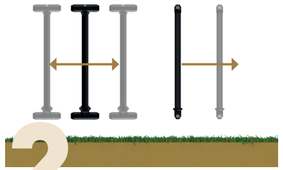
The direction of the probe refers to ***WHERE* THE PROBE IS POINTING**.

The first scan line defines the direction for the entire scan.

All scan lines must be scanned **PARALLEL TO EACH OTHER**. Thus, always keep the probe pointing in the **SAME DIRECTION**. This also applies to *Scan Mode Zigzag*.

If available, use the **ARROW** on top of the probe as a reference.

DO NOT TURN OR ROTATE the probe during scanning.



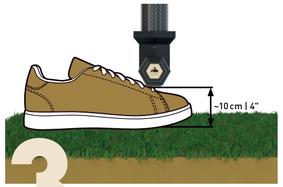
2 ORIENTATION

The orientation of the probe refers to ***HOW* THE PROBE IS HELD**.

Always keep the probe **STRAIGHT** and upright during the measurement. **DO NOT PIVOT OR TILT** the probe.

Do not grip the vertical probe tightly to force it into a diagonal position while scanning. **HOLD IT LOOSELY** at the top and let gravity keep the probe vertical.

CORRECT HANDLING of the probe ensures clear scan images and reliable results.



3 DISTANCE

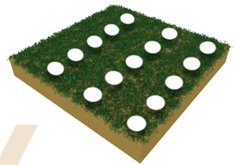
Keep the probe at the same **HEIGHT** during the measurement.

RECOMMENDED DISTANCE TO THE GROUND: 5–10 cm | 2–4" (use the height of the foot arch as a reference).

Do not scan too close to your **SHOES**.

If the scan field contains **WIDESPREAD OBSTACLES** such as dense vegetation that cannot be cleared, raise the probe slightly and maintain this distance to the ground consistently throughout the entire scan.

CONSISTENT HEIGHT ensures reliable scan results.



4 ACCURACY

Maintain **CONSISTENT SPACING** between scan lines to ensure full coverage and avoid gaps or overlaps in the scan field.

Move at a **STEADY AND EVEN PACE** during the scan; changes in speed can distort the scan data.

Follow the **PREDEFINED SCAN GRID** accurately to preserve resolution and make interpretation easier.

Avoid abrupt movements, stops, or direction changes, as **SMOOTH SCANNING** ensures uniform data collection.

Consider using the **IMPULSE MODE *MANUAL*** in rough or uneven terrain to maintain control and accuracy.

OKM

CHECKLIST: MEASUREMENT

1 PROBE DIRECTION

- [ ] The **FIRST SCAN LINE** defines the probe direction for the entire scan.
- [ ] All scan lines must be **PARALLEL TO EACH OTHER**.
- [ ] Keep the probe pointing in the **SAME DIRECTION**.
- [ ] Use the **ARROW** on top of the probe as a reference.
- [ ] **DO NOT TURN OR ROTATE** the probe.

2 PROBE ORIENTATION

- [ ] Keep the probe **STRAIGHT** during scanning.
- [ ] **DO NOT PIVOT OR TILT** the probe.
- [ ] **DO NOT FORCE** the probe into a diagonal position.

3 DISTANCE TO THE GROUND

- [ ] Keep the probe at a **CONSTANT HEIGHT** throughout the scan.
- [ ] Recommended distance to the ground: **5–10 cm | 2–4"**.
- [ ] Do not scan too close to your **FOOTWEAR**.
- [ ] If widespread obstacles cannot be removed, increase the height for the **ENTIRE SCAN**.

4 ACCURACY OF THE MEASUREMENT

- [ ] Keep **EQUAL SPACING** between scan lines.
- [ ] Scan at a **STEADY PACE**.
- [ ] Follow the **SCAN GRID** precisely.
- [ ] **SMOOTH SCANNING**: Avoid sudden stops or abrupt movements.
- [ ] Consider using the **IMPULSE MODE *MANUAL*** in rough terrain.

ADDITIONAL TIPS FOR SCANNING

☐ ALIGN SCAN LINES IN NORTH–SOUTH DIRECTION

Experience shows that scans performed in a north–south or south–north direction often produce clearer results. If possible, align the scan lines with the Earth's natural magnetic field by walking parallel to the meridians.

This does not apply to 90° rotated or diagonal control scans as well as to elongated objects aligned parallel to the scan lines. Especially in the latter case, performing a scan perpendicular to the object is highly recommended.

☐ MAINTAIN A SLOW AND STEADY SCANNING PACE

Walk slowly and evenly along each scan line to collect a sufficient number of impulses (measuring points). A higher number of impulses results in a more detailed scan image, making it easier to detect smaller or deeply buried objects.

☐ INCREASE SCAN LINE DENSITY AND IMPULSE COUNT

Increasing the number of scan lines and reducing the distance between impulses improves data density. The more impulses are collected, the higher the image resolution and the better the chance of identifying subtle or hidden anomalies.

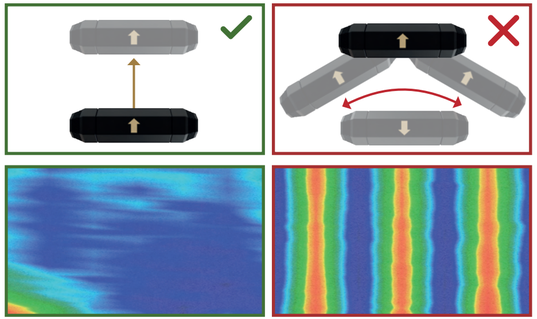
☐ KEEP EQUAL DISTANCE BETWEEN SCAN LINES

Keep the distance between scan lines consistent throughout the scan. Uniform spacing ensures an accurate scan image, as the software *Visualizer 3D Studio* displays the imported scan data at evenly spaced intervals. Inconsistent spacing can therefore lead to distortions in the scan image.

In addition, equal and reduced distances help prevent interpretation errors and missed targets between the lines.

☐ MAINTAIN A CONSTANT SPEED IN ALL SCAN LINES

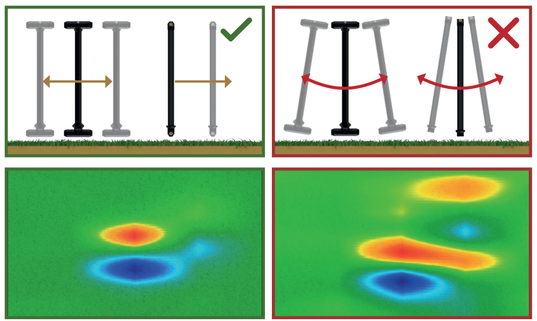
Try to walk all scan lines at the same speed to achieve reliable and comparable results. If uneven terrain or obstacles make a constant pace difficult, switching from *Impulse Mode Automatic* to *Manual* can help maintain scan accuracy.



3.1 KEEP THE PROBE DIRECTION CONSISTENT

The direction of the probe – meaning ***WHERE*** **THE PROBE IS POINTING** – is a critical factor during the scan process. All lines must be scanned in straight lines without curves and parallel to each other, whereas the first scan line defines the reference direction. All following scan lines must maintain the same direction and be spaced at regular, consistent intervals. This rule also applies when using *Scan Mode Zigzag*. The arrow on top of the probe (if available) helps you to point in the defined scan direction throughout the entire measurement.

DO NOT ROTATE THE PROBE WHILE SCANNING. This applies to all scan modes based on magnetic field measurement – such as *3D Ground Scan*, *Magnetometer* or *Live Sound*, *Pinpointer*, *Tunnel Scan*, and *Live Scan*. If the probe is rotated during the measurement or points in the wrong direction, false signals or even striped scan images can occur – see ***6.5.4 Vertically Striped on page 43***.



3.2 KEEP THE PROBE ORIENTATION STRAIGHT

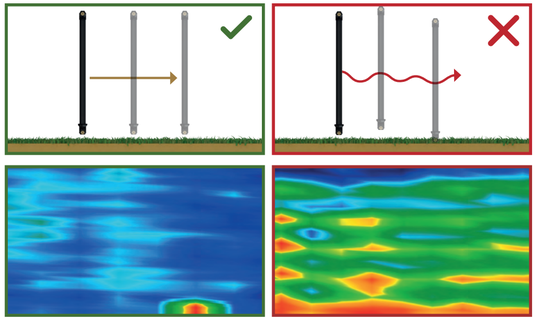
The orientation of the probe – meaning ***HOW*** **THE PROBE IS HELD** – is crucial for accurate and reliable scan results. During the scan, always hold the vertical probe straight and upright, and the horizontal probe well balanced and perfectly level.

DO NOT PIVOT OR TILT THE PROBE.

Avoid holding the probe diagonally, tilting it forward or backward. Avoid gripping it tightly or forcing the probe into a particular angle while walking. Rather hold the probe gently at the top and allow gravity to naturally keep it vertical.

Maintaining the correct probe orientation ensures that the sensors receive a consistent signal. Improper handling of the probe can produce false signals, meaning the scan may indicate an anomaly where there is actually no target. Thus, focus on smooth, straight movement, keeping the probe stable throughout the measurement process.

OKM



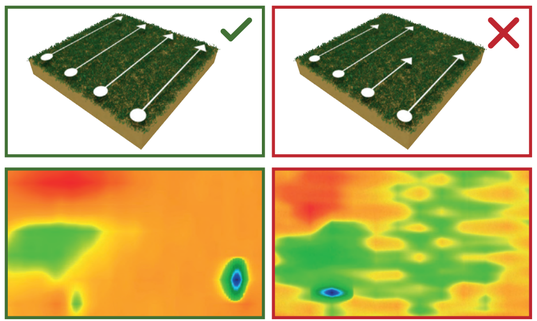
3.3 MAINTAIN A CONSTANT PROBE HEIGHT

Maintaining a **CONSISTENT DISTANCE** between the probe and the ground is essential for accurate scan results. Keep the probe at the same height as at the starting point.

The **RECOMMENDED DISTANCE TO THE GROUND IS 5–10 cm (2–4")**, which is roughly equivalent to the height of the foot arch – a convenient reference for consistent positioning. However, avoid detecting your footwear or use shoes without metallic appliances.

If the scan field contains widespread obstacles such as dense vegetation, crop stubble, or bushes that cannot be cleared, raise the probe slightly and maintain this height consistently throughout the entire scan. For isolated obstacles such as tree trunks or rocks, split the scan field or use *Impulse Mode Manual*. **TAKE NOTES OF SUCH IRREGULARITIES** and in which scan line they occur, as these information may be relevant for later analysis.

Varying the distance to the ground, for example by repeatedly bouncing while walking, can distort the scan images and affect the accuracy of the results.



3.4 ENSURE HIGH SCAN ACCURACY

Scan accuracy is essential for achieving **HIGH-RESOLUTION SCAN IMAGES**, as consistent line spacing, speed, and impulse density directly determine the level of detail and reliability.

The distance between scan lines and impulses should be consistent to avoid gaps or overlaps. **SMALLER DISTANCE BETWEEN IMPULSES** – ideally 15 to 20 cm (6 to 8") – further increases the precision of the scan image: The more impulses are recorded, the more detailed the scan image and the smaller the detectable objects.

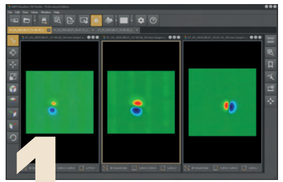
In addition, a smooth, continuous, and **CONSTANT PACE** ensures that the sensors collect data evenly. By carefully controlling both the impulse density and the walking speed, you can achieve scan images that are both accurate and easy to interpret.

Poor accuracy in measurement – such as inconsistent spacing or uneven walking – can result in distorted images, misleading signals, or missed targets. Using the *Impulse Mode Manual* may help you achieve high-resolution scans even in rough terrain.

4 FOLLOW-UP: REVIEWING AND VERIFYING SCAN RESULTS

Perform control scans and document important details related to the measurement. Depending on the detector model and available storage capacity, control scans can be carried out before transferring the data to a notebook with *Visualizer 3D Studio*.

With some detectors, such as the Rover C4, storage capacity is limited. In these cases, up to four scans belonging to the same scan field can be transferred together and organized as a complete scan series or project before proceeding with the measurements on the next scan field.



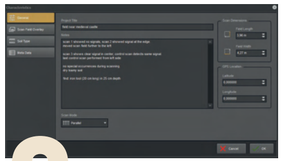
1 REPEAT

Perform at least **2 CONTROL SCANS** on the same scan field.

Repeat a Control Scan from the same starting point and in the **SAME DIRECTION** as the original scan.

Perform another Control Scan from the side, **ROTATED BY 90°**.

Note: **REAL TARGETS DON'T MOVE** – shifting anomalies usually indicate soil mineralization or other interferences.



2 SPECIFY

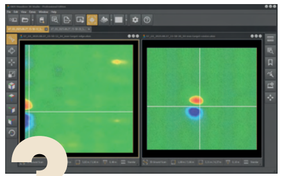
TAKE NOTES on the measurement and the scan field for later reference.

Record **SOIL CONDITIONS**, weather, and **SURROUNDINGS** (walls, fences, power lines).

RECORD SPECIAL SITUATIONS that occurred during the scan (stepping over obstacles, avoiding objects, stumbling), and note where they occurred (scan line).

You may add **PHOTOS** of the scan field.

Use clear project names and **ORGANIZE YOUR SCAN DATA**.



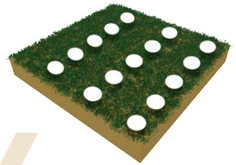
3 ADJUST

Take a first look at your scan images: Check whether anomalies appear near the edges of the scan field.

CENTER THE AREA OF INTEREST by moving the scan field.

Adjust the field to identify the boundaries of a target.

SIGNALS WITHOUT A CLEAR STRUCTURE usually indicate soil mineralization, not relevant targets.



4 CONSIDER

Use **IMPULSE MODE *MANUAL*** when obstacles, dense vegetation, or sloping terrain prevent a steady walking pace.

TRIGGER IMPULSES MANUALLY by pressing the button on the probe/Control Unit.

CHECKLIST: FOLLOW-UP

1 CONTROL SCANS

- [ ] Perform at least **2 CONTROL SCANS.**
- [ ] Repeat the initial scan under **IDENTICAL** conditions.
- [ ] Perform another scan from the side, **ROTATED BY 90°.**
- [ ] Note: **REAL TARGETS DON'T MOVE.**

2 SCAN DOCUMENTATION

- [ ] **TAKE NOTES** for later reference.
- [ ] Document **SOIL AND WEATHER CONDITIONS** (mineralization, moisture, soil composition).
- [ ] Document **ENVIRONMENTAL FACTORS** (vegetation, obstacles, nearby structures).
- [ ] Document **SPECIAL SITUATIONS** occurring during the scan and note where they occurred (scan line).

3 SCAN FIELD ADJUSTMENT

- [ ] Do signals appear **NEAR THE EDGES**? Center the area of interest.
- [ ] Capture the **BOUNDARIES OF TARGET STRUCTURES**.
- [ ] **SCATTERED SIGNALS** usually do not indicate relevant targets.

4 CONSIDERATION OF MANUAL MODE

- [ ] Do **OBSTACLES OR DENSE VEGETATION** prevent you from a steady scanning pace?
- [ ] Does **SLOPING OR DIFFICULT TERRAIN** prevent you from a steady scanning pace?

ADDITIONAL TIPS FOR FOLLOW-UP

- [ ] **REVIEW SCAN DATA ON SITE AND ADJUST IMMEDIATELY**

Check the scan image briefly during or between scans to adjust the scan field on site in real time, if necessary. This allows you to perform additional useful scans immediately, especially if returning to the scan location at a later time would be difficult or delayed.

- [ ] **ADD PHOTOS OF THE SCAN FIELD**

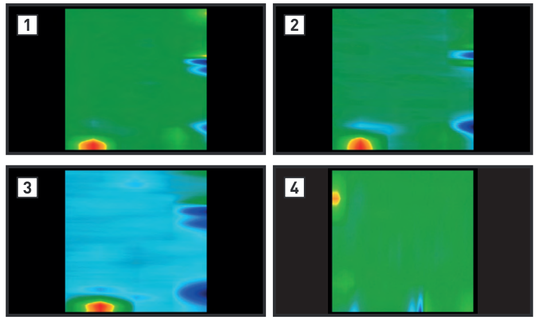
Take photos clearly showing the scan area and its surroundings. These images help document ground conditions, obstacles, and the exact scan location, supporting later evaluation and comparison.

- [ ] **ADD GPS LOCATION INFORMATION**

Whenever possible, record GPS coordinates of the scan field. This helps precisely relocate the scan field, supports documentation, and ensures accurate reference for future scans or follow-up investigations.

- [ ] **USE UNIQUE PROJECT NAMES AND ORGANIZE SCAN DATA**

Assign clear and unique project names and keep all scan data well organized. Structured data management makes it easier to find, compare, and interpret scans at a later stage, especially when working on multiple projects or returning to a site after some time.



4.1 REPEAT YOUR SCAN

Perform at least two **CONTROL SCANS** to verify and confirm your scan results. Repeating the scan on the same field is essential, as the first scan is rarely perfect.

Control scans (images 2 and 3) should be performed from the same starting point and in the same direction as the original scan (image 1). This helps to check the consistency and **REPEATABILITY** of the measurement.

A further control scan (image 4) should be performed from the side, rotated by 90° relative to the original scan. This additional perspective helps to **VALIDATE THE POSITION AND STRUCTURE** of detected anomalies. Moreover, it helps detect elongated objects that might otherwise remain hidden between the scan lines.

Note: **REAL TARGETS DO NOT MOVE.** If an anomaly changes its position in the control scans, it is most likely caused by soil mineralization or other interferences rather than a real object.

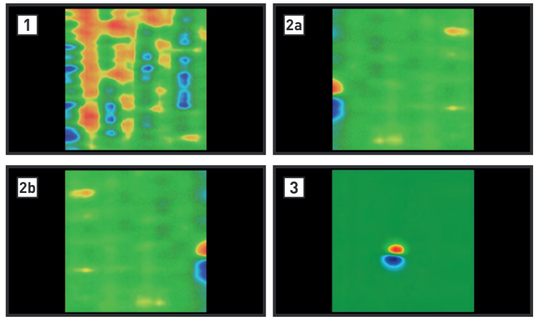
4.2 SPECIFY SCAN CONDITIONS

Any special conditions or irregularities that occur during the scan should be noted, as they can directly influence the scan image and help explain unusual signal structures.

It is recommended to take photos of the scan field in order to document the original ground conditions. In addition, notes on **SOIL CONDITIONS** – including mineralization and soil composition – as well as **WEATHER CONDITIONS** and surrounding **ENVIRONMENTAL FACTORS** like vegetation, obstacles, or nearby structures can be highly relevant.

SPECIAL SITUATIONS during the scan should be documented as well. These include stepping over or around obstacles, temporarily lifting the probe, or stumbling during the measurement. It is particularly important to note where these events occurred, for example the affected scan line or position within the scan field. We recommend to repeat the scan and improve your scanning technique.

Clear project naming and well-organized scan data further ensure that measurements can be easily reviewed, compared, and interpreted at a later stage.



4.3 ADJUST THE SCAN FIELD POSITION

Even if all scanning instructions are followed correctly, it may happen that the central area of the scan field shows little or **NO ANOMALIES**, while more interesting **SIGNALS APPEAR NEAR THE EDGES** (images 2a and 2b).

In other situations, a large number of **SCATTERED SIGNALS** in all colors may be visible across the entire scan image, appearing without a recognizable structure (image 1). Such scan images typically indicate soil mineralization rather than distinct target signals.

In both cases, the scan field should be moved: **REPOSITION THE SCAN FIELD** so that the area of interest is located in the center of the scan (image 3). This improves image clarity and makes interpretation easier.

Adjusting the scan field can also help to better **IDENTIFY THE BOUNDARIES AND SHAPE** of the target object, leading to more reliable and detailed scan results.

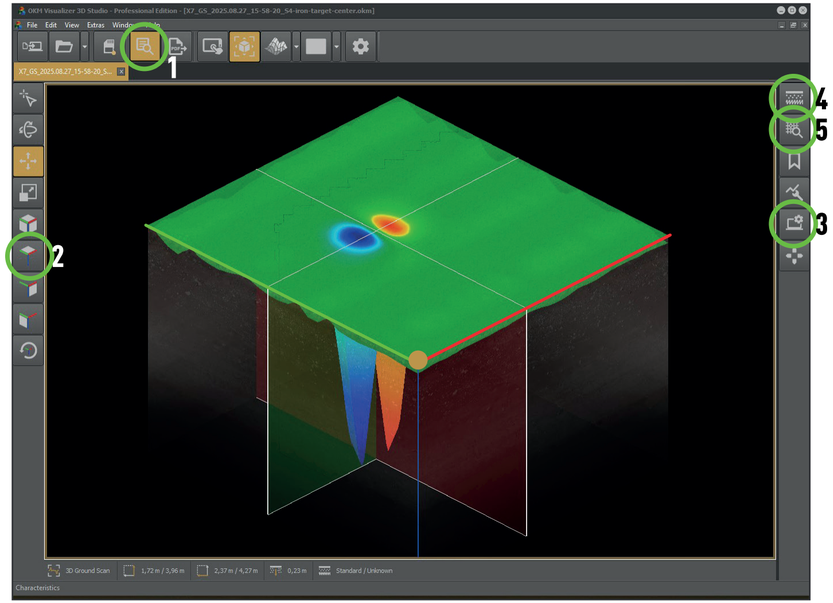
4.4 CONSIDER MANUAL IMPULSE MODE

Impulse Mode Manual can be especially useful when the scan field contains larger obstacles or **DIFFICULT, UNEVEN OR SLOPED TERRAIN CONDITIONS**. If you need to climb over tree trunks, wall foundations, or if rocky ground, slippery surfaces, or dense undergrowth prevents you from walking at a consistent speed, switching to *Impulse Mode Manual* can improve measurement quality.

In *Impulse Mode Manual*, impulses are not recorded automatically at the preset intervall. Instead, a scan value is only collected when you press the button on the probe or Control Unit. This gives you **FULL CONTROL OVER WHEN SCAN VALUES ARE RECORDED** and helps you keep similar distances between impulses, resulting in a more even scan grid and more reliable scan images.

5 FIRST STEPS IN VISUALIZER 3D: PREPARING AND ENHANCING SCAN DATA

This chapter focuses on understanding the basics after transferring the scan files. It introduces the five most important steps for a fast and easy scan analysis using the proprietary software *Visualizer 3D Studio*. How to transfer scan files from your detector is explained in the corresponding manual.



1 MAIN TOOLBAR: CHARACTERISTICS
also accessible via Main Menu > Edit
or keyboard shortcut F9

2 LEFT SIDEBAR: TOP VIEW
also accessible via Main Menu > View
or keyboard shortcut F6

3 RIGHT SIDEBAR: VISUALIZATION
also accessible via Main Menu > View > Sidebars

4 RIGHT SIDEBAR: SOIL TYPES
also accessible via Main Menu > View > Sidebars

5 RIGHT SIDEBAR: SCAN INFORMATION
also accessible via Main Menu > View > Sidebars

OKM

CHECKLIST: 5 STEPS IN VISUALIZER 3D STUDIO

1 CHARACTERISTICS

- [ ] Add a **PROJECT TITLE**.
- [ ] Enter **FIELD LENGTH** and **FIELD WIDTH**.
- [ ] Check the **SCAN MODE**.
- [ ] Add **DETAILS** about irregularities, environment etc.

2 TOP VIEW

- [ ] Toggle between **VIEWS**.
- [ ] Select **TOP VIEW**.

3 TARGET FOCUS

- [ ] Adjust the **THRESHOLD**.
- [ ] Toggle between **COLOR SCHEMES**.
- [ ] Use **WIREFRAME** view.

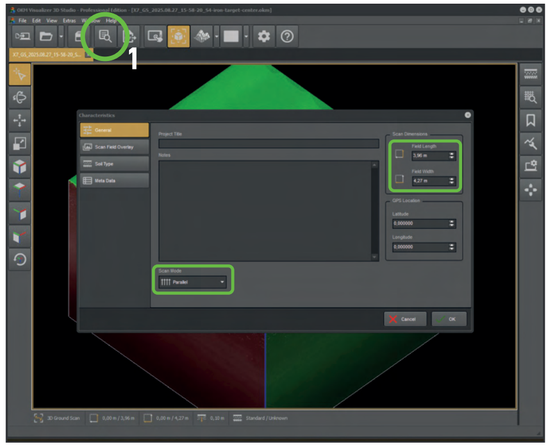
4 SOIL TYPE

- [ ] Select a **SOIL TYPE**.
- [ ] Define **INDIVIDUAL SOIL TYPES**, if neccessary.

5 SCAN INFORMATION

- [ ] Place the **CROSSHAIRS** on prominent signals.
- [ ] Determine the **DEPTH** and **POSITION**.
- [ ] Read and compare **SCAN VALUES**.

5.1 ADD SCAN DETAILS



Open *Characteristics* to add further scan details. This window can be opened via

- Icon in the main toolbar
- Keyboard shortcut F9
- Main Menu > *Edit* > *Characterisctics*.

The *Characteristics* window allows to add or adjust scan details in the *General* tab:

- ***FIELD LENGTH and FIELD WIDTH.***
- ***SCAN MODE***: *Parallel* or *Zigzag*.
- *Project Title*.
- *Notes* about the scan characteristics, details about the scan field, terrain, conditions, and weather, or special incidents during the scan process.
- *GPS Location* to remember the location of your scan field.

In the other 3 tabs, users can add a *Scan Field Overlay*, select a *Soil Type*, or get more *Meta Data*. For more details, please refer to the *Software Documentation*.

The **SCAN FIELD DIMENSIONS** play a key role in locating a target within the scan area. The more accurately the length and width are defined, the more reliably the position and size of potential targets can be determined. The units can be switched between metric (m) and imperial (ft) via Main Menu > *Extras* > *Preferences* > *Measurement System*.

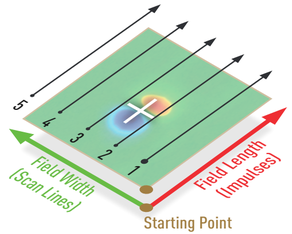
Information about the **SCAN MODE** used can be helpful during scan evaluation. In *Characteristics*, this information is displayed for reference only. Changing this option does not affect the graphical representation of your scan result.

5.1.1 SCAN FIELD DIMENSIONS

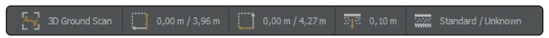
The scan field dimensions are essential for accurately locating the target object within the scan field.

The more precisely the length and width are defined, the more accurate the conclusions about the position and size of potential targets.

The **FIELD LENGTH** corresponds to the length of the scan lines and is directly related to the number of impulses recorded. It is either set before starting the scan or, when using Auto mode, at the end of the first scan line.

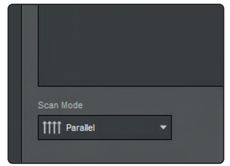


The **FIELD WIDTH** is related to the number of scan lines and corresponds to the total distance between the first and the last scan line.



The assigned field length and field width are also displayed in the status bar at the bottom of the graphical user interface.

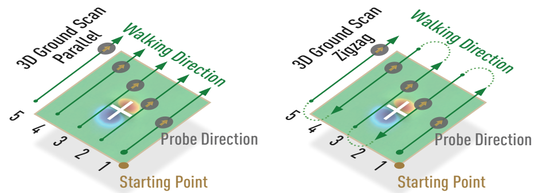
5.1.2 SCAN MODE



In *Visualizer 3D Studio*, the *Scan Mode* is displayed for reference only. With newer detectors, this information is transferred automatically. If it is missing, you can enter it here in *Characteristics*.

With detectors such as the Rover C4, the correct scan mode must be selected during the file transfer. If in doubt, transfer the scan file with the correct information again. For more details please refer to the respective manual.

Even though the *Scan Mode Zigzag* can save time, especially on large scan fields, we always recommend using the *Scan Mode Parallel*. *Parallel* mode allows to collect scan data in higher quality, as scanning can be performed more consistently in terms of walking speed and alignment of the scan lines.



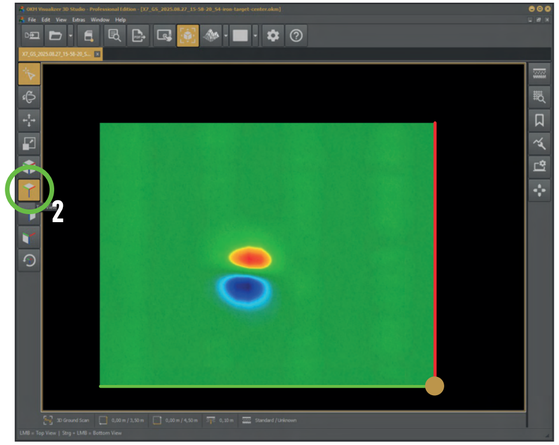
Information about the scan mode can be helpful during scan evaluation: For example, vertically striped scan images may indicate that

- the scan was performed in *Zigzag* scan mode, but the probe was rotated in every other scan line – see ***6.5.4 Vertically Striped on page 43***, or
- the *Scan Mode* was set to *Parallel*, but the scan field was traversed in zigzag manner – see ***Reference: Rotational Tests with OKM Rover C4 on page 52***.

In both cases, the probe pointed at least once in the wrong direction.

For proper scanning techniques, please refer to the respective manual and/or the **OKM 3D GROUND SCAN GUIDE** – see ***7 Related Resources on page 44***.

5.2 SELECT TOP VIEW



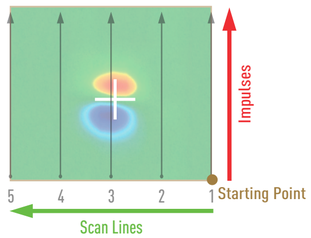
Toggle between the different preset views to rotate the current scan image. For fast and easy scan evaluation, we recommend *Top View*. This is accessible via

- Icon in the left sidebar
- Keyboard shortcut F6
- Main Menu > *View* > *Top View*.

5.2.1 ADVANTAGES OF TOP VIEW

The top view allows you to

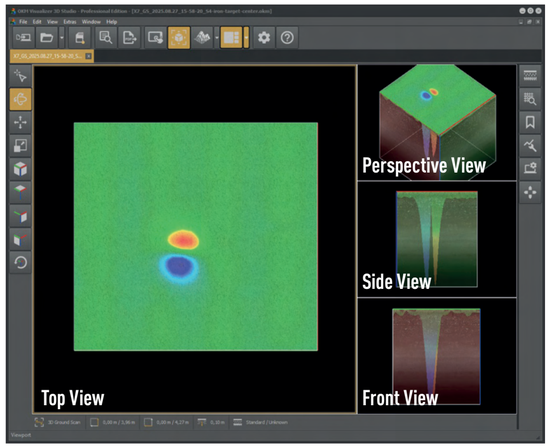
- gain a better **ORIENTATION** in your scan field: The starting point is located in the bottom right corner.
- see the **AXES** more clearly: The red axis represents the impulses along a scan line, while the green axis represents the scan lines next to each other.
- see the signals in the scan field in the correct **SPATIAL PROPORTIONS** and thus determine their position more accurately.
- move and set the **CROSSHAIRS** more easily – see ***5.5.1 Placing the Crosshairs on page 28***.



5.2.2 FURTHER VIEWS

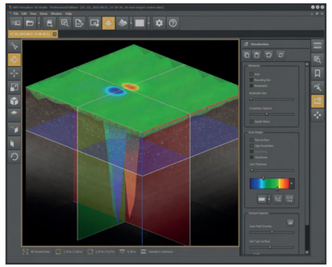
In addition to the *Top View*, three further **PRESET VIEWS** are available: *Perspective View*, *Side View*, and *Front View*. These are predefined rotations of the same scan image, allowing the scan result to be examined from different angles.

The viewing angle can also be adjusted individually using the mouse when **ROTATE** mode is in the left sidebar is activated.



To display various perspectives simultaneously – as shown in the screenshot above – select the desired **VIEWPORT** (Default) or (Quad) in the main toolbar. For more details, please refer to the *Software Documentation*.

PERSPECTIVE VIEW provides a three-dimensional representation of the scan image and is especially useful for an initial assessment of potential targets.



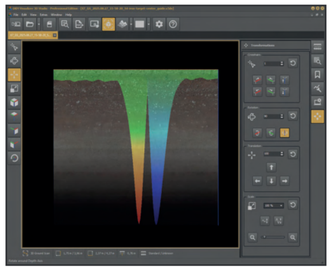
The spatial visualization allows you to recap the scan by viewing signal position and signal strength at the same time.

If *Flat Surface* and *Depth Plane* are activated in the *Visualization* panel (right sidebar), the Perspective View allows you to **SEE SIMULTANEOUSLY:**

WHERE the signal is located in the scan field and

HOW STRONG the signal is.

SIDE VIEW AND FRONT VIEW are helpful for **IDENTIFYING SIGNAL AMPLITUDES** more easily. *Side View* always displays the scan from the right-hand side. To switch to the left-hand side, use Ctrl + . *Front View* always displays the scan from the starting point in the scan direction. Press Ctrl + to switch to rear view.

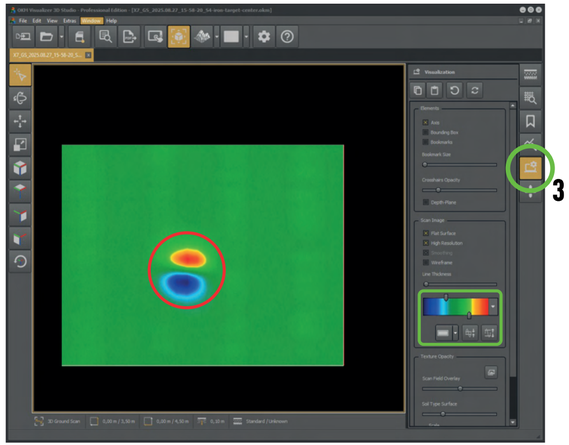


If multiple signals are located close to each other, view the scan from all four directions to distinguish individual signals:

Open *Transformations* in the right sidebar, go to *Rotation*, and rotate the scan around the blue axis with . An angle of 90° is preset, but can be adjusted individually.

This allows you to examine the scan from different angles and improves the reliability of the signal interpretation.

5.3 FOCUS ON TARGET SIGNALS

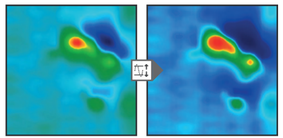


Optimize the scan image to focus on the most prominent signals. To do this, adjust its *Visualization* such as *Threshold* and *Color Scheme*. These options can be adjusted in the control panel accessible via:

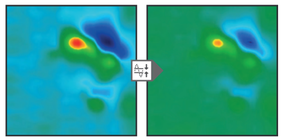
- Icon in the right sidebar
- Main Menu > *View* > *Sidebars* > *Visualization*.

5.3.1 ADJUST THE THRESHOLD

Use the buttons to increase or to reduce the *Threshold* gradually.



Increasing the threshold brings more anomalies into view within the scan image. This can be helpful for **IDENTIFYING WEAKER SIGNALS** or previously hidden anomalies that may be masked by stronger signals.

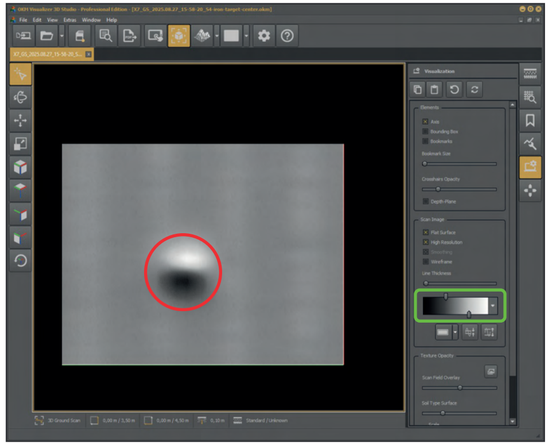


Reducing the threshold allows you to **DE-EMPHASIZE MINOR SIGNALS** and helps focus on the core structure of larger, dominant anomalies. This makes the main targets clearer and easier to evaluate.

okm

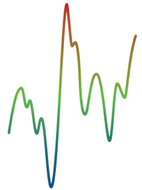
5.3.2 TOGGLE BETWEEN COLOR SCHEMES

Toggling between the preset *Color Schemes* helps you recognize detected signals more clearly: By varying the color settings, subtle or partially hidden signals can be made more visible, allowing weak anomalies to stand out more clearly from the background.



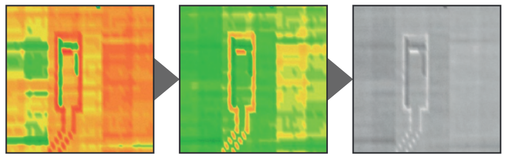
Select your preferred color scheme from the list to display the scan image in different colors. Depending on the color scheme selected, certain anomalies and details may become visible.

5.3.3 COLOR INTERPRETATION

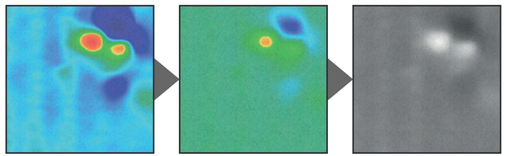


The scan values are processed relative to each other in the software. As a result, every scan image **always** contains at least one red, green and blue (RGB) signal: The maximum value is displayed as red signal, while the minimum value is shown in blue. For correct interpretation, the next important step is to evaluate the signal strength (amplitude) – see ***6.4 Assess Scan Value Strength on page 38***.

Applying various color schemes allows a more flexible interpretation of scan data: It helps you move away from fixed assumptions about the meaning of green, red, and blue signal structures in scan images.



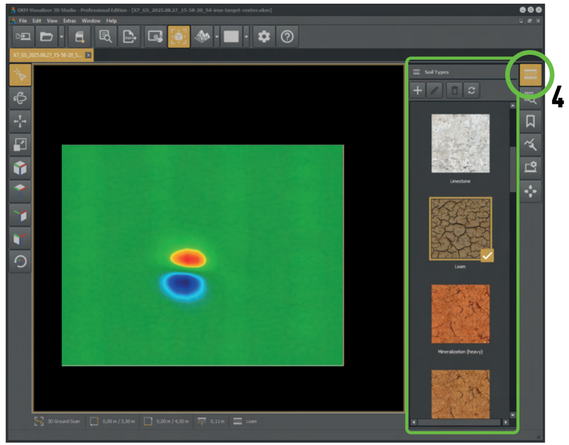
Original Scan | **Scan with adjusted Threshold** | **Scan with switched color scheme**



Original Scan | **Scan with adjusted Threshold** | **Scan with switched color scheme**

Depending on soil conditions and scan parameters, the color distribution in scan images can shift significantly. In such cases, relying on the widespread but misleading interpretation that red indicates a treasure and blue indicates a void is not appropriate.

5.4 SELECT A SOIL TYPE



Select the *Soil Type* that best matches your scan field from the list via:

- Icon in the right sidebar
- Main Menu > *View* > *Sidebars* > *Soil Types*
- Main Menu > *Edit* > *Characteristics* > *Soil Type* (third tab).

The available soil classifications in *Visualizer 3D Studio* comprise:

- OKM Standard Soil Types,
- USDA Soil Classification[1],
- OKM GPR Soil Types[1],
- User Defined Soil Types[1].

The predefined soil types in *Visualizer 3D Studio* represent general average soil conditions worldwide. For more precise depth measurements, we recommend defining individual soil types[1].

The more closely the selected soil type matches the actual conditions of your scan area, the more accurate the depth estimation will be.

Selecting the correct soil type directly influences the depth determination – see ***5.4.1 Soil Type Parameters on page 27***.

Moreover, take into consideration that the visible surface layer does not always correspond to the actual soil profile. Soils are often composed of different layers. If you are not sure, choose a soil type that is typical for the region or most prevalent at your site. If you are unsure which soil type to select, *Standard* can be used, as it represents the average of all *OKM Standard Soil Types*.

Alternatively, read the depth values at significant scan points while toggling between soil types and derive an average value.

5.4.1 SOIL TYPE PARAMETERS

The predefined soil types are based on specific parameters which are also required when creating custom soil types. These parameters influence the depth determination as follows:

DIELECTRIC CONSTANT is a measure of the conductivity of electric fields. The higher the value, the lower the depth penetration. This is particularly relevant for scans with the Ground Penetrating Radar (GPR).

PERMEABILITY is the measure of the conductivity of magnetic fields. The higher the value, the lower the depth penetration.

MINERALIZATION defines the metal content of the soil. Higher mineralization reduces the detection depth.

Higher **HUMIDITY** values of the soil reduce the depth performance of GPR, but do not affect 3D Ground Scans.

HOMOGENEITY defines the compactness of the soil. Higher homogeneity increases the detection depth.

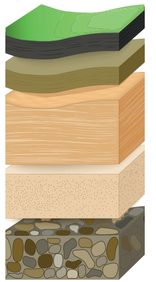
The parameters of the predefined soil types are displayed as tooltip when hovering the mouse over the individual soil types. Moreover, the parameters of the selected soil type are provided in the *PDF Report*[1] under *Soil Type Information*.

PDF Report[1] is accessible via

- Icon in the main toolbar,
- Keyboard shortcut Ctrl + P, or
- Main Menu > *File* > *Export* > *PDF Report*.

5.4.2 ADVANTAGES OF CUSTOM SOIL TYPES

Soil profiles are often composed of multiple layers with different properties. Thus, experienced users who have detailed knowledge of the local soil conditions may also create User Defined Soil Types[1].



The visible surface layer does not necessarily represent the actual subsurface soil structure. If the soil composition is unknown, select the soil type that is

- typical for the region,
- most predominant at the site,

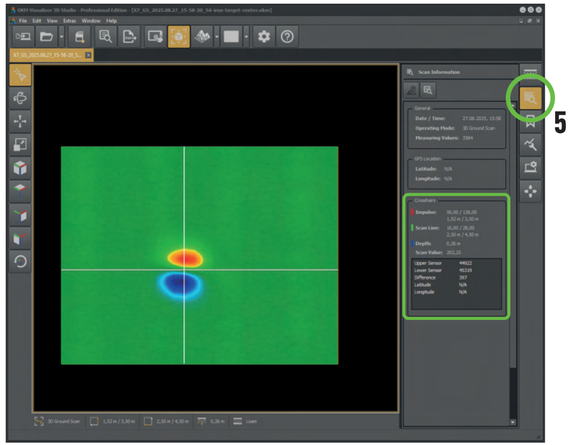
or create a custom soil type based on average values derived from the actual soil composition.

Defining custom soil types

- allows depth estimations to be adapted more precisely to local ground conditions, going beyond the global average soil types provided in the software,
- allows a more reliable interpretation of depth-related structures in complex or layered soil conditions,
- improves consistency across repeated scans in the same area, and
- increases the comparability of scan results over time.

[1] only available in *Professional Edition*

5.5 ACCESS SCAN INFORMATION



The scan data at the crosshairs position is provided under *Scan Information*. Open the panel via

- Icon in the right sidebar
- Main Menu > *View* > *Sidebars* > *Scan Information*.

In addition, a summary is provided in the status bar below the scan image:

The status bar is especially useful when comparing depth estimates across different soil types: Cycle through the soil types and read the corresponding depth values simultaneously in the status bar. This way, there is no need to switch back and forth between the *Scan Information* and *Soil Types* panels.

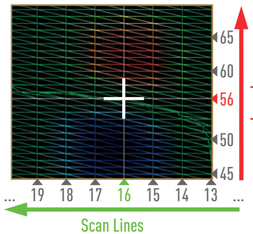
5.5.1 PLACING THE CROSSHAIRS

Select the most prominent signals in the scan image to view the corresponding scan values under the *Crosshairs*. To do this

- use the arrow keys ← → ↑ ↓ on the keyboard
- or activate *Selection Mode ("Pick")* via in the left sidebar.

Place the crosshairs at the desired measurement point by moving it with the arrow keys on the keyboard. Alternatively, move the mouse pointer to the desired spot and click into the scan image with the left mouse button (LMB).

This is most efficiently done in *Top View* – see ***5.2.1 Advantages of Top View on page 22*** –, as it provides a clear, plan-view representation of the scan field.



In this example, the crosshairs are positioned at the following location within the scan field: Impulse 56 (out of 128) in Scan Line 16 (out of a total of 28).

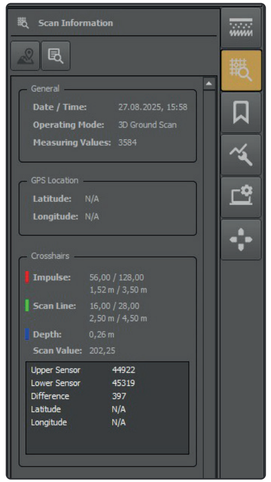
In addition, especially when Wireframe is enabled (via Right Sidebar > Visualization > Scan Image), it becomes clear that both the red and the blue signals consist of multiple impulses (measuring points).

Pease note: The crosshairs can only be placed on measuring points, not between them. A higher number of impulses increases scan resolution and provides greater flexibility and precision when positioning the crosshairs.

If you cannot see the crosshairs (white lines), check that the *Crosshairs Opacity* slider via Right Sidebar > *Visualization* > *Elements* is not set to zero (left).

5.5.2 MEASURING VALUES VS. SCAN VALUE

First, both *measurement point* and *scan point* are used synonymously to refer to an **IMPULSE**. In contrast, *measuring values* and *scan values* have different meanings:



The **MEASURING VALUES** refer to the individual **IMPULSES**, meaning specific measurement points at which the sensors record data. These are defined by the number of scan lines multiplied by the number of impulses per scan line:

The example shown on the left comprises 28 scan lines with 128 impulses each, resulting in a total of 3,584 measuring values.

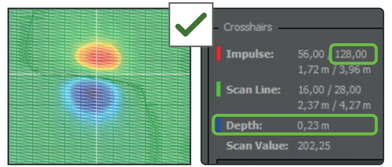
The **SCAN VALUE** is the actual value detected by the sensor at that specific impulse (measurement point) after modification – if filters were applied. This value indicates the signal strength. This becomes particularly clear in the Side View – see ***5.2.2 Further Views on page 23***:

The stronger the amplitudes of the scan values, the more significant the anomaly.

All values are processed relatively to each other and visualized as color-coded amplitudes – always represented by red and blue signals – see ***5.3.3 Color Interpretation on page 25***. These provide indications about the depth and kind of buried objects and structures.

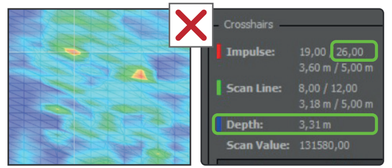
5.5.3 DETERMINING THE DEPTH

If a combined red-blue signal is detected, indicating the potential presence of a ferromagnetic object – see ***6.3 Interpret Colors and Structures on page 36*** –, place the crosshairs between the two signals as shown in the example below. Based on our experience, this method has repeatedly provided fairly **RELIABLE DEPTH ESTIMATES**:



The scan field is relatively small, but a very high number of impulses were recorded. As a result, the strong red and blue signals each extend over several impulses and, hence, indicate a target object.

As an alternative approach, an **AVERAGE DEPTH** can be calculated from the depth values at the most prominent signals. When using this method, note that very strong signals can lead to **MISLEADING CONCLUSIONS** about the depth. In particular, signals that are very strong in amplitude (scan value) but are very small in size (number of impulses) tend to produce less reliable depth indications. Based on experience, such very small signals (in terms of number of impulses they span) represent small near-surface items or interferences rather than deeper, clearly defined targets.



The scan field size is adequate, but the number of impulses is low. The wireframe view reveals that the strong signals comprise only one impulse each, but show a strong depth. This indicates a false signal.

The larger the signal (in terms of spatial extent – meaning the number of impulses it spans), the more significant the anomaly and the more reliable the depth estimation.

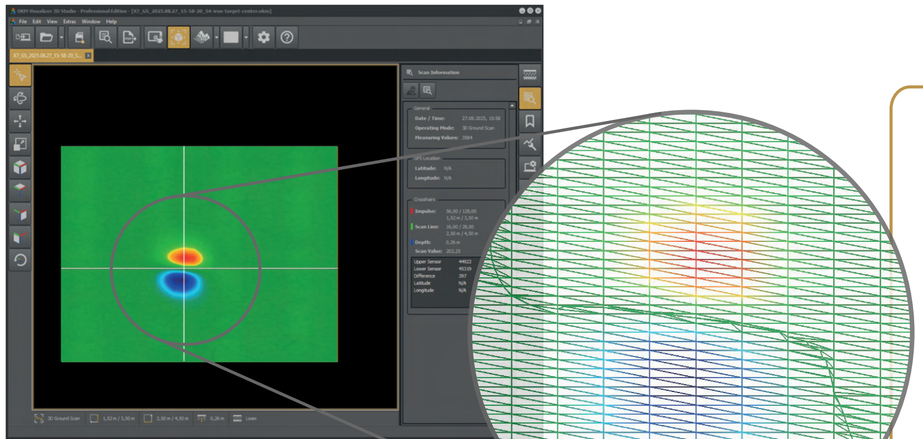
The indicated depth is an estimate, as it depends on various factors such as soil structure and soil composition. During excavation, the target object may therefore be encountered at a shallower depth than indicated – which can be advantageous and reduce further digging – or it may be located deeper than expected. Excavation should continue until the object is found, provided the signal has been verified as reliable – see ***6.2 Identify Real vs. False Targets on page 34***.

6 SCAN ANALYSIS: IDENTIFYING AND ASSESSING TARGET SIGNALS

This chapter explains what the scan image actually shows and how to interpret signals correctly.
UNDERSTANDING COLORS AND STRUCTURES – red, green, and blue – is essential for meaningful analysis.

No scan is ever identical to another; slight variations are always present.

With the previously acquired understanding of scan values and amplitudes, scan analysis becomes easier and more reliable. Real scan examples with clear explanations help illustrate how signals are formed and how they should be interpreted.



The *Wireframe* view improves the visibility of individual impulses (measuring points) and allows for

- easier and more precise crosshairs placement,
- clearer contrast between the signals, and
- faster assessment of the spatial extent of signals.

In addition, test different views with *High Resolution* enabled and disabled.

Both these options – *Wireframe* and *High Resolution* – can be enabled in the *Visualization* panel under *Scan Image*, accessible via:

- Icon in the right sidebar
- Main Menu > *View* > *Sidebars* > *Visualization*.

CHECKLIST: EVALUATION

1 CONTROL SCAN COMPARISON

- [ ] Arrange **WINDOWS SIDE BY SIDE**.
- [ ] **ROTATE THE SCAN IMAGE** if you scanned from a 90° angle.
- [ ] Look for **REPEATABLE SIGNALS** at the same positions.

2 MINERALIZATION VS. REAL TARGETS

- [ ] Identify noise (scattered signals) caused by **SOIL MINERALIZATION**.
- [ ] Look for prominent signals that extend over **MORE THAN 1 IMPULSE**.

3 COLOR INTERPRETATION

- [ ] Look for **STRONG SIGNALS** (high contrast) regardless of their color.
- [ ] **RECONSIDER MULTIPLE INTERPRETATIONS** of the different color-coded signals, as well as combinations of both.

4 SCAN VALUE STRENGTH

- [ ] View the scan in **SIDE VIEW OR FRONT VIEW** to identify prominent maximum amplitudes.
- [ ] Check the **SCAN VALUES AND THE VALUE RANGE** between the maximum, average, and minimum values of prominent impulses.

5 TROUBLESHOOTING

- [ ] Identify **SCATTERED SIGNALS** – so-called noise.
- [ ] Recognize **STRIPED SCAN STRUCTURES** and their causes.
- [ ] Question **RECURRING SIGNALS** and determine their origin.
- [ ] Prevent **MISSING SCAN DATA** due to transfer errors.

ADDITIONAL TIPS FOR EVALUATION

☐ ENSURE CORRECT SCAN FIELD DIMENSIONS

You can add and adjust the scan field dimensions at any time within your scan file in *Visualizer 3D Studio*.

The scan field size is – unlike what is common in graphic design – always defined as **SCAN FIELD LENGTH FIRST**, then width. This is based on the fact that the length of the first scan line is set first. The number of scan lines is determined afterwards, which defines the scan field width.

☐ UNDERSTAND THE LIMITATIONS OF THE TECHNOLOGY

Scans cannot precisely reveal what an object is – such as whether it is a vase, ring, statue, box, or sword. However, large objects such as aircraft or bunkers can become visible in their shape if the scan field is large enough.

☐ CONSIDER THE HALO EFFECT OF FERROUS OBJECTS

For ferromagnetic objects, the halo effect and corrosion traces in the surrounding soil must be considered, as they can distort the perceived size and shape of the target.

☐ CONSIDER THE PHYSICAL LIMITATIONS OF MAGNETIC FIELD MEASUREMENT

Furthermore, non-magnetic objects can only be detected through the surrounding structures. *Magnetic Field Measurement*, as the name implies, requires the presence of anomalies in the magnetic field.

Anomalies are not caused by non-magnetic objects such as diamonds or gold themselves. However, they can be caused by human intervention, such as excavation. Depending on how recently the digging took place, this disturbance may still be visible in the scan results.

☐ LOOK FOR ASSOCIATED FINDS

Precious metals can be detected through associated finds, e.g. if it is located in a treasure chest with iron fittings, if ferrous artifacts are present nearby, or if it is made of an alloy that combines precious metals with ferromagnetic metals.

☐ ASSESS MAGNETIC PROPERTIES AND GEOLOGICAL CONTEXT

Gold deposits can still be detected with a high level of expertise and knowledge about the geological conditions that are typically associated with the desired valuable target structures. For more information, refer to our documents on *Mineral Scan*.

6.1 COMPARE CONTROL SCANS

Control Scans are essential for verifying detected signals. By comparing multiple scans of the same area, it becomes easier to distinguish real targets from noise or soil-related effects. **REAL TARGETS DO NOT MOVE**, so their position should remain consistent across all Control Scans.

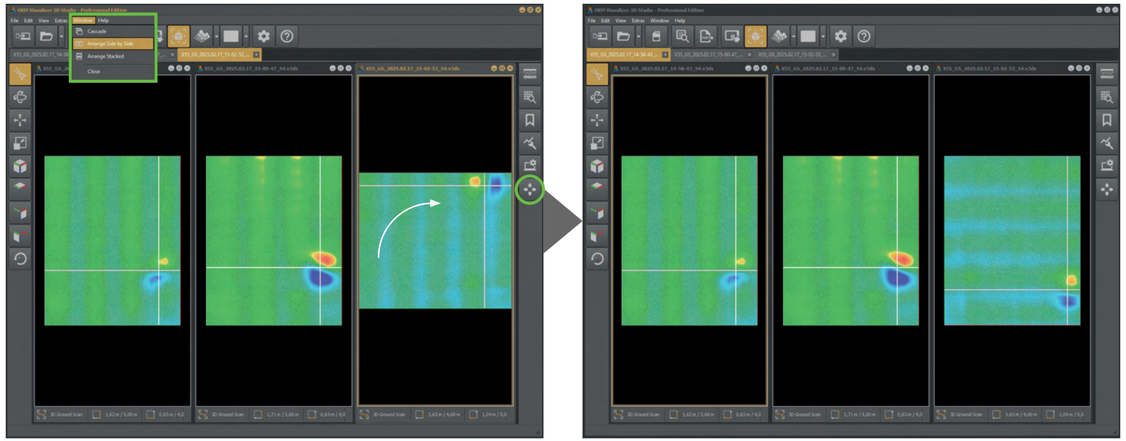
For an effective comparison, **ARRANGE THE SCAN IMAGES NEXT TO EACH OTHER** via Main Menu > *Window* > *Arrange Side by Side*. Viewing the scans simultaneously allows you to identify differences and similarities more easily (see example below).

If the area was scanned from a 90° angle, **ROTATE THE SCAN IMAGE** to improve comparability between the scans (see example below).

If the scan field is sufficiently large and the signals shift only slightly, this is acceptable and does not invalidate the result.

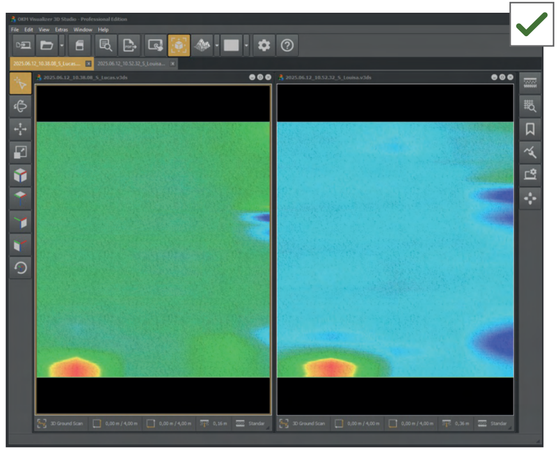
Minor variations in signal size and position within the scan field can occur if:

- the walking speed varied during the measurement,
- a different number of impulses was recorded, or
- the starting point was slightly offset.



When comparing an original scan (left) and its control scan (right), both performed on the same scan field of adequate size and from the same starting point: The prominent signals at the same positions are promising, regardless of the surrounding colors in the scan field. If a positive or negative pole of an object has been detected, the signal will usually occur at the same position and with the same polarity in repeated scans.

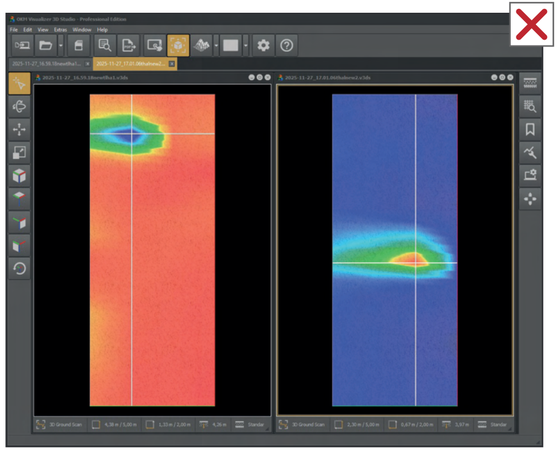
By adjusting the *Threshold* or changing the *Color Scheme* – see ***5.3 Focus on Target Signals on page 24*** – or by applying filters (so-called *Modifiers*) – see ***6.5 Troubleshooting on page 42*** –, the color spectrum can be smoothed to make relevant signals easier to identify.



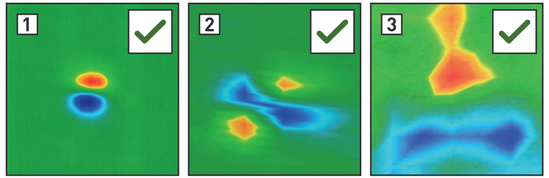
When comparing an original scan (left) and its control scan (right), both performed on the same scan field of adequate size and from the same starting point: The strong shift of the signal in terms of position and color is more likely an indication of false signals.

As already described, scan values are recorded and processed relative to each other – see ***5.3.3 Color Interpretation on page 25***. This means that a stronger signal can dominate the scan result and partially or completely mask previously detected weaker signals. In the example below, the result could therefore be caused by such a stronger signal influencing the relative scaling.

It is also possible that a false signal was generated – for example by inadequate probe movements or by metallic items held too close to the sensors during the measurement.



6.2 IDENTIFY REAL VS. FALSE TARGETS



A promising – or at least potentially relevant – signal is usually a **COHERENT, CLOSED COLOR AREA** – in RGB color scheme either red or blue –, often circular or oval in shape. The single signal shape can be clearly distinguished from the surrounding scan field and extends over multiple scan values (see image 1: red signal + blue signal).

In some cases, the signals are shaped or combined to a more complex and irregular structure of multiple signals. This is commonly referred to as

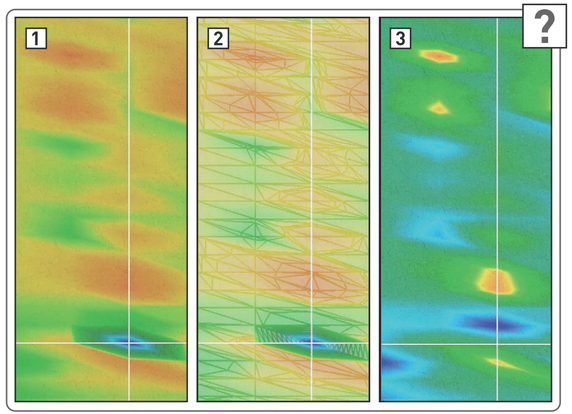
- **SIGNAL STRUCTURE**: e.g. U-shaped, elongated, curved signal shapes (see blue signal in images 2 and 3), or
- **SIGNAL CLUSTER**: signal shapes of the *same color* located close to each other (see orange signals in image 3).

A **COMBINED SIGNAL STRUCTURE** consists of two or more signals of *various colors* – usually red and blue (see image 2).

By considering not only the shape, color combination, and spatial extent, but also its amplitude and repeatability in control scans, the signal structure can be described as a **SIGNATURE**. This term is interpretative, not purely descriptive. In most cases, a combined red-blue signature indicates a ferromagnetic object (see image 1).

For further interpretation, the next important step is to evaluate the signal structures – see ***6.3 Interpret Colors and Structures on page 36***.

What all of these shapes, clusters, structures, and signatures have in common is their **CLEAR CONTRAST** to the surrounding scan field, that is ideally represented as relatively neutral background. To better recognize and identify these contrasts, consider using the *Wireframe* view – see ***6 Scan Analysis: Identifying and Assessing Target Signals on page 30***.

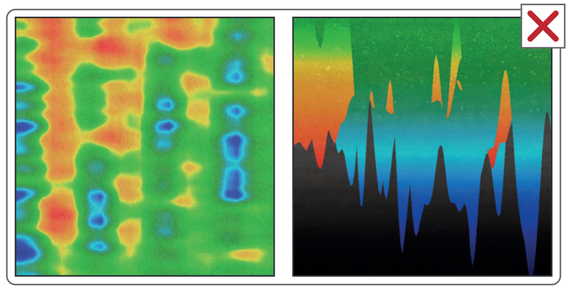


If a strong signal shape (red or blue) is visible in the scan image, but consists of only one single impulse, this indicates either

- a very **SMALL NEAR-SURFACE METAL OBJECT**, such as a screw or nail, which should be removed from the scan field, or
- a **FALSE SIGNAL**, in which case applying the *Signal Correction* modifier can be helpful – see ***6.5.5 False Signals on page 43***.

In the example above, the original scan (see image 1) showed a green-orange background (neutral soil) with a prominent blue spot. On closer inspection using *Wireframe* view (see image 2), it becomes apparent that the strong blue signal consists of only a single scan value. After applying the *Signal Correction* modifier, the blue signal at this position disappears, while other signals become more prominent.

In either case, this does not indicate a meaningful signal. Proceed with a Control Scan, or, if desired, proceed with excavation at your own judgment.

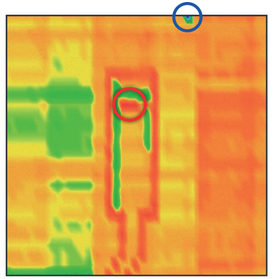


If the scan image shows a large number of signals, this usually indicates so-called noise, appearing as scattered signals without any clear structure. In *Side View*, no prominent amplitudes are visible either. This is an indication that no meaningful target signal is present and that the observed effects are most likely caused by **SOIL MINERALIZATION** – see ***6.5.1 Scattered Signals on page 42***.

OKM

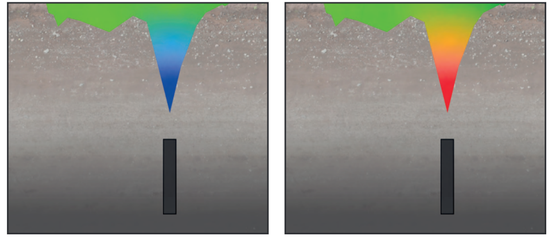
6.3 INTERPRET COLORS AND STRUCTURES

First, move away from the commonly held assumption that red indicates a treasure – sometimes it is even claimed to be gold – and that blue indicates a natural void – see ***5.3.3 Color Interpretation on page 25***. Always keep in mind the physical limitations of the technology (gold and voids are non-magnetic) and toggle between the color schemes to gain a different perspective on the meaning of signal colors.

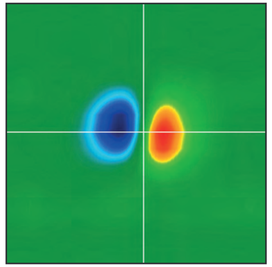


Every scan image always contains red, green and blue signals. The maximum value is always displayed as red signal, the minimum value is shown in blue.

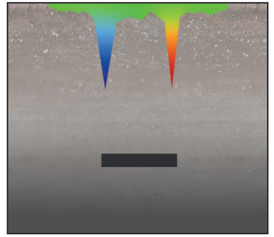
A verified **SINGLE SIGNAL** usually indicates one pole of a ferromagnetic object that is vertically oriented: either the **negative pole** that is represented by a **blue signal** (lowest values) or the **positive pole** by a **red signal** (highest values). Multiple such signals, red and blue mixed, can occur separetely within the same scan field (see image above).



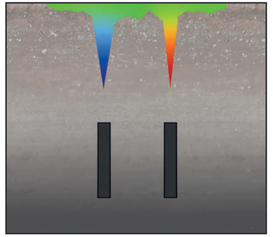
A **COMBINED RED-BLUE SIGNAL STRUCTURE OF EQUAL STRENGTH**



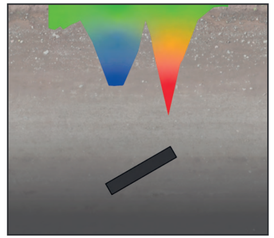
is usually interpreted as a target object containing ferromagnetic components and lying horizontally in the ground. In horizontal orientation, the **positive** and **negative** pole of the object are visible.



As shown in the single-signal example, the red-blue signal combination can also indicate two separate objects positioned vertically in the ground.

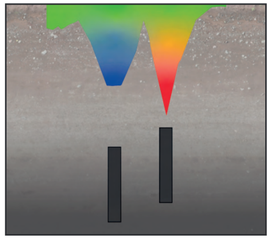


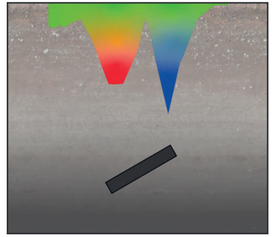
A **COMBINED RED-BLUE SIGNAL STRUCTURE OF VARYING STRENGTHS** can also be interpreted as a ferromagnetic target object. In this case, it may be positioned diagonally in the ground, where the stronger signal represents the upper end of the object.

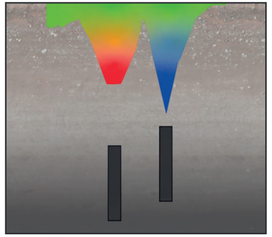


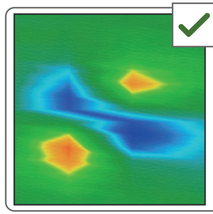
Alternatively, this signal structure may indicate two target objects positioned vertically with their respective poles oriented upward.

In this scenario, the stronger signal originates from the object with the stronger ferromagnetic pole or located at a lower depth (closer to the sensor).







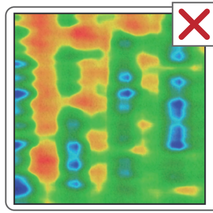


In this example, the following signals can be identified: a smaller, weaker orange signal, a larger orange-red signal, as well as an elongated diagonal blue signal with slightly stronger amplitudes at both ends. This structure may indicate:

- *a large rectangular object with multiple ferromagnetic components,*
- *two horizontal ferromagnetic objects, or*
- *various diagonal and/or vertical objects.*

Performing control scans with higher resolution can reveal additional details for more precise conclusions.

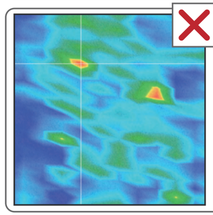
The different sizes and color intensities of the signals provide indications of the relative depth and position of the objects in relation to each other.



This example contains numerous red and blue signals with highly **IRREGULAR DISTRIBUTION**, *lacking a coherent structure. As a result, it is very likely that this scan field does not contain a detectable target object.*

The observed signals are most likely caused by **SOIL MINERALIZATION** *and/or small near-surface interference sources, such as nails, screws, or other small scrap metal.*

Only a control scan allows verification of the signals through their repeatability.



If a signal corresponds to only one impulse, it is most likely a **FALSE SIGNAL** *that can be reduced by applying the Modifier Signal Correction – see* ***6.5.5 False Signals on page 43****.*

Signals that span only 1 impulse can also originate from very small near-surface objects such as a screw or nail, which can usually be removed from the scan field with minimal effort.

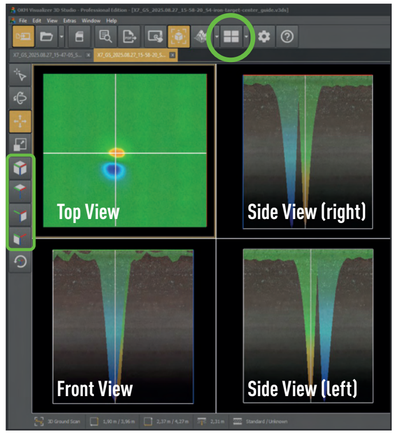
Only a control scan allows verification of the signals through their repeatability.

For correct interpretation, the next important step is to evaluate the signal strength (amplitude) – see ***6.4 Assess Scan Value Strength on page 38***.

6.4 ASSESS SCAN VALUE STRENGTH

6.4.1 VISUAL SIGNAL IDENTIFICATION

As already mentioned in ***5.2.2 Further Views on page 23***, *Side View* and *Front View* are particularly useful for identifying signal amplitudes visually based on the scan image. These views make it easier to recognize where the strongest amplitudes occur and how the values are distributed in the scan field.



If several signals are located close to each other, it is recommended to inspect the scan from all four directions. Viewing the scan from multiple angles helps to better distinguish individual signals and increases the reliability of the signal interpretation.

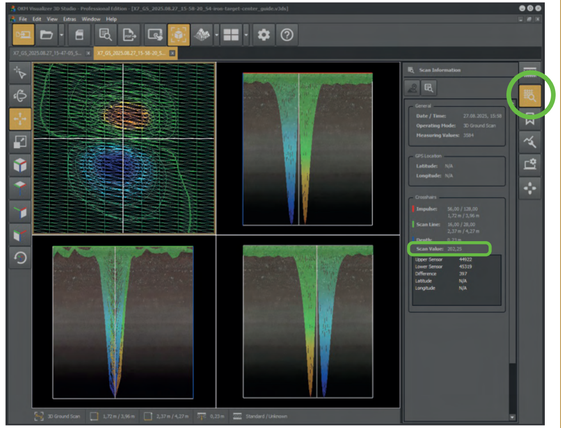
In this example, the combined red-blue signal structure can be distinguished very easily in Side View, but it is very difficult to identify in Front View.

1. Select the desired **VIEWPORT** or in the main toolbar to display multiple perspectives simultaneously.
2. Switch between views to find the most suitable **PERSPECTIVES** for identifying signal amplitudes – via left sidebar or by using the following Keyboard Shortcuts:

F5 Perspective View
F6 Top View
F7 Side View (right)
F8 Front View
Ctrl + F7 Side View (left)
Ctrl + F8 Rear View

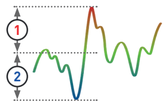
6.4.2 SCAN VALUE RANGES AND AMPLITUDES

Use the *Scan Information* panel (via right sidebar) to access exact **SCAN VALUES**. Check the values at the most prominent signals and compare them to the surrounding background values. The most prominent signals correspond to the **minimum** and the **maximum** scan value, representing the strongest amplitudes in the scan.



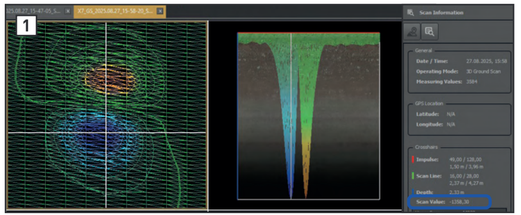
Determine the ranges between

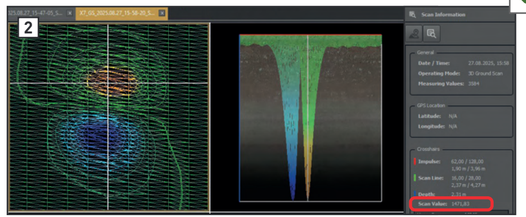
1. **minimum** and **average neutral** values,
2. **maximum** and **average neutral** values,
3. the average deviations compared to the highest amplitudes (Δ) – see ***6.4.4 Sufficient Signal Amplitudes on page 41***.



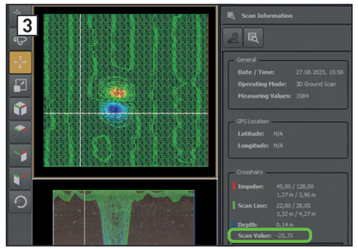
The scan values must show sufficiently large deviations.

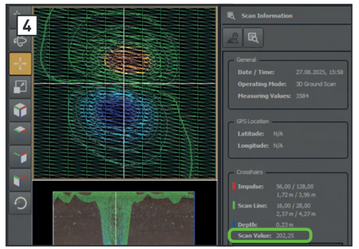
6.4.3 EXAMPLES: EVALUATING SIGNALS BASED ON VISUALS AND VALUES

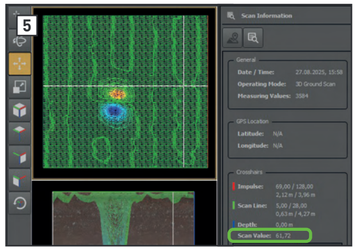




EXAMPLE 1: *This scan shows a **minimum scan value of –1,385.30** (image 1) and a **maximum of 1,471.83** (image 2).*





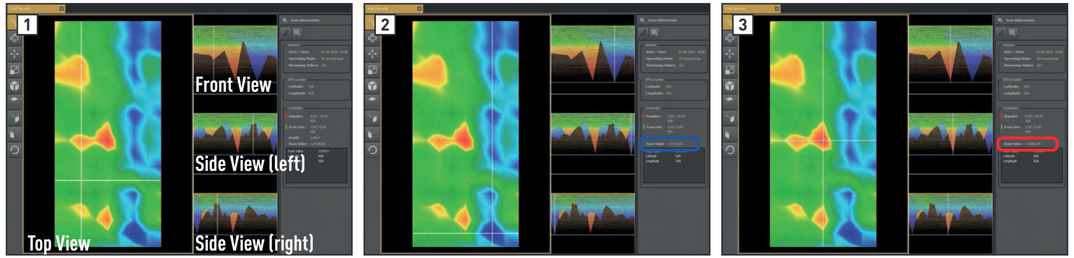


*The neutral soil shows scan values at different positions (images 3 to 5) of –25.75, 202.25, and 61.72. These scan values differ remarkably from the **minimum –1,385.30** and **maximum 1,471.83**, resulting in a significant difference with an average magnitude of around 1,300. This range indicates a clearly distinguishable signature and thus a potential target object.*

For further evaluation, the next important step is to determine the position and estimate the depth of the signal – see ***5.5 Access Scan Information on page 28***.

Scans with only few prominent signals are the easiest to interpret. In practice, scan images often appear more complex, as shown in the following examples:

EXAMPLE 2: *In this scan image, **3 signal structures (blue)** and **3 signal clusters (orange)** can be identified when looking at the Top View at first glance. These signals are surrounded by **neutral soil**, represented in the typical green color.*



*When looking for the minimum (image 2) and maximum scan values (image 3), the available views play an essential role: In Front View, both the **blue minimum** and the **red maximum** are easy to identify. In the Side Views, however, multiple blue and reddish peaks are visible, all of which may appear relevant at first glance.*

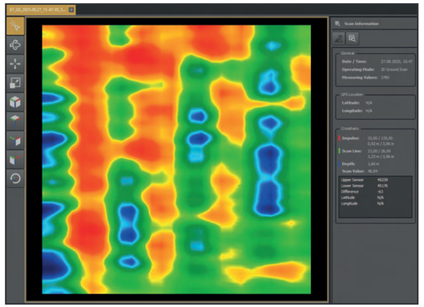
*During analysis of all views together with the scan values, it becomes apparent that the **minimum value of 131,511** is located at the beginning of the third scan line, while the **maximum value of 131,696** is positioned in the center of the scan field. Based on these facts, the distribution could initially suggest the presence of three separate ferromagnetic objects, buried horizontally with a slight inclination. However, comparing these values and their deviations, it becomes clear that the amplitudes are very low.*

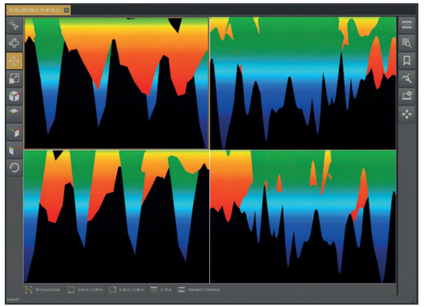
The average difference between the signal amplitudes and the neutral values is only around 100, which appears very low given the overall high scan values of >130,000. Despite the visually appealing signal clusters and structures, it is therefore questionable whether real target objects are present. The signals may instead be caused by external interference, for example from metal fences located to the right of the scan field, which could explain the blue signal patterns. For a more reliable interpretation, control scans are required.

In order to identify relevant signals that indicate the presence of a potential target object, it is important to

1. focus on **ISOLATED LOCAL SIGNALS** and its immediate surroundings,
2. compare the signal structure to the **OVERALL SCAN FIELD**, including the neutral scan values as well as the total number of collected measuring values,

both visually and in terms of the scan values. In cases of uncertainty, performing control scans is always recommended.





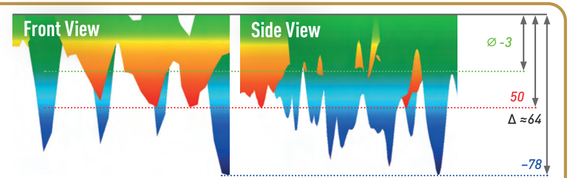
EXAMPLE 3: *This scan result shows many scattered signals in Top View (image 1). When viewing the scan from all four sides (image 2), it becomes apparent that both blue and red signals are distributed across the entire scan field and exhibit similar amplitudes.*

*A closer examination of the scan values ranging from a **minimum of –78** to a **maximum of 50** confirms that no relevant signals are present. This clearly indicates soil mineralization rather than a meaningful target.*

6.4.4 SUFFICIENT SIGNAL AMPLITUDES

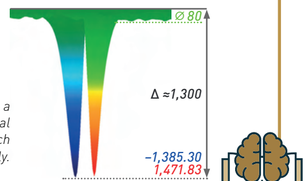
After reviewing the examples, it becomes clear that, both the initial visual impression and the scan values are essential, as a purely visual interpretation can be misleading. The graphical representation may be distorted in a way that makes amplitudes appear stronger than the underlying scan values actually are – see Example 2 and the following corresponding graphical summary:

The scan values must show sufficiently large deviations. If amplitudes and deviations are too low in value, they usually do not indicate relevant targets.



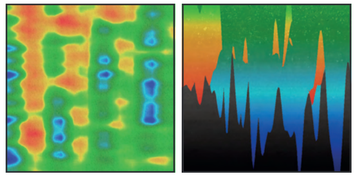
In the summary of Example 3 (above), the blue and red values are distributed very evenly and show similar strong amplitudes throughout the entire scan field. No individual signal stands out clearly.

In contrast, Example 1 (right) shows a remarkable difference between the signal amplitudes and the neutral values, which confirms the presence of a relevant anomaly.



6.5 TROUBLESHOOTING

6.5.1 SCATTERED SIGNALS



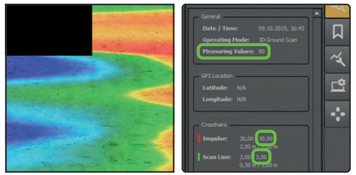
Scattered signals – so-called **NOISE** – usually appear as a large number of red and/or blue signals distributed across the entire scan field without showing a recognizable or coherent structure. This is a typical indication of **SOIL MINERALIZATION** rather than real targets.

This structure is also recognizable in *Side View* or *Front View*, where similarly strong or weak amplitudes are distributed across the entire scan field and no prominent signal can be identified.

Recommendations:

- Repeat the scan using smaller scan line spacing to achieve higher resolution.
- If possible, dig near the surface and remove small scrap metal, then scan again.
- If no clear targets are detected in control scans, increase the size of your scan field or move the scan field and continue scanning in a different area – see ***Reference: OKM eXp 5500 Scan on Field near Medieval Castle on page 45.***

6.5.2 MISSING SCAN DATA



The empty corner in the upper left indicates a **DATA TRANSFER ERROR**. Such scan images are extremely rare, as this issue only occurs with detectors requiring the number of impulses to be entered manually during data transfer.

In the example above, the preset number of impulses per scan line is 30, but the total number of impulses transfered is only 80 (see right image).

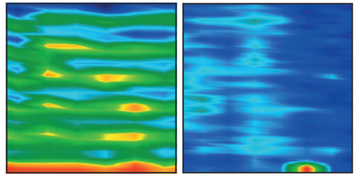
These 80 impulses are automatically distributed across the three scan lines as 30, 30, 20 – leaving the final section of the third scan line empty (see left image).

As a result, the measuring values are shifted within the scan field, making a reliable analysis impossible.

Recommendations:

- Transfer the scan file again and enter the correct number of impulses per scan line.
- Repeat the measurement if the scan file is no longer available.

6.5.3 HORIZONTALLY STRIPED



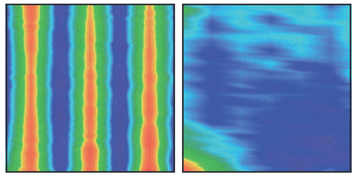
Horizontally striped signal structures are usually caused by **PROBE BOUNCING**, meaning the probe was moved up and down while scanning (left image).

The scan result can usually not be corrected using modifiers. It is required to repeat the scan (right image).

Recommendation:

- Repeat the scan and make sure to walk smoothly and evenly, keeping the probe at a constant height throughout the scan – see ***3.3 Maintain a Constant Probe Height on page 13***.

6.5.4 VERTICALLY STRIPED



Vertically striped signal structures are usually caused by **ROTATIONAL ERRORS**. These occur when the scan direction is not consistently followed. Depending on the selected *Scan Mode*, the scan field must be traversed in specific ways. In both *Parallel* and *Zigzag* mode, the probe must always point in the same direction as in the first scan line. If this is not maintained, rotational errors can occur in the scan image (see left image).

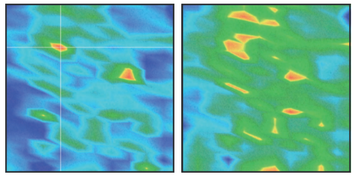
Recommendations:

- Repeat the scan in *Zigzag* mode correctly.
- Repeat the scan in *Parallel* mode.
- Learn about correct scanning techniques in our manuals, 3D Ground Scan Guide, and tutorials.
- Apply the *Rotational Correction* modifier.

Correct the scan values retrospectively using the *Modifier* **ROTATIONAL CORRECTION**. You can find this filter via Right Sidebar > *Modifiers*: Click the + and select *Rotational Correction* – see ***Reference: Rotational Tests with OKM Rover C4 on page 52***.

Please note: A correctly performed measurement is always preferable (see right image). Alternatively, use *Parallel* mode, which consistently produces clearer and more reliable scan results.

6.5.5 FALSE SIGNALS



False signals can appear as isolated spots (see left image) or as regularly recurring signals. These are most commonly caused by **IMPROPER SCAN TECHNIQUE**, such as insufficient distance between metallic objects and the sensors.

In some cases, a strong single-impulse signal originates from a **SMALL, NEAR-SURFACE METAL**.

Recommendations:

- Clear the scan field of small metallic objects such as screws or nails on the surface.
- Repeat the scan with the maximum possible distance between the sensors and the Control Unit, smart device, clothing or footwear.
- Apply the *Signal Correction* modifier.

Remove false signals retrospectively using the *Modifier* **SIGNAL CORRECTION** (see right image). You can find this filter via Right Sidebar > *Modifiers*: Click + and select *Signal Correction*.

If the result shows only noise or no prominent signals, there is very likely nothing present at that location. In any case, we recommend performing control scans.

7 RELATED RESOURCES

For more detailed information and practical guidance, please refer to the available documentation and tutorials:

- *Visualizer 3D Studio* provides an integrated **SOFTWARE DOCUMENTATION** as well as online resources to support efficient data analysis.
  - www.okmdetectors.com/v3ds-documentation
- The **3D GROUND SCAN GUIDE** and the **MANUAL** of your specific detector offer essential instructions on correct scanning technique and device handling.
  - www.okmdetectors.com/3d-ground-scan-guide
  - www.okmdetectors.com/manuals
- **OKM WHITEPAPERS** include case studies that contain real scan data from specific search projects, providing deeper insight into practical applications and scan interpretation.
  - www.okmdetectors.com/whitepapers
- **VIDEO TUTORIALS**, such as the *Quick Scan Check* playlist and dedicated videos on *Control Scans*, are available on our **YOUTUBE CHANNEL** and provide visual step-by-step examples.
  - www.youtube.com/okmdetectors

Further documentation and guides aimed at improving efficiency and scan interpretation are currently in development and will be made available in the future.

8 SCAN ANALYSIS CASE STUDIES

In this section, we have compiled scans from customer inquiries, search projects, and reference projects. The following examples illustrate practical scan results of **BOTH IDEAL AND CHALLENGING CASES**, along with the steps required for a reliable scan analysis, which have been explained in this guide.

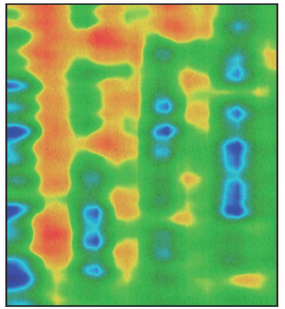
For better traceability, the following details are provided in each reference example:

- scan images: comprise a scan series from the same scan field – unless explicitly stated otherwise,
- scan series organization: include scan number, indication of whether it is a control scan, the detector used, and the scan field dimensions,
- **Output:** provides a brief description of what is immediately noticeable in the scan image,
- **Recommendation:** provides suggested steps to improve or verify the analysis,
- a more detailed explanation, and
- in the final scan image of each scan series, the excavated target object – if applicable.

You performed scans that show particularly clear results or special characteristics, and you have excavated at the corresponding location? Help us confirm how well the scan analysis matches the actual result. We would be grateful to expand the following **REFERENCE CATALOG** *with your contribution.*

Join our **TREASURE REWARD PROGRAM** *and send us your scan files along with details about your excavation!*

www.okmdetectors.com/treasure-reward

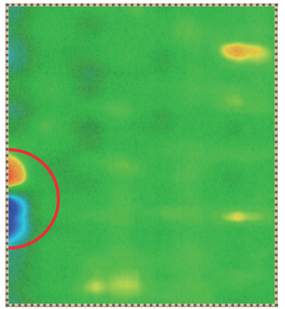


Scan 1 4×4 m | 13×13 ft

Output: Scattered signal structure across the entire scan field, no distinct signal, multiple interference effects.
Recommendation: Check Side View (see below): Blue and red signals do not show significant amplitudes. Eliminate obstacles and/or move the scan field.

Very unstable signal structure, shows linked red and isolated blue signals, looks streaky, no clear signal can be detected.

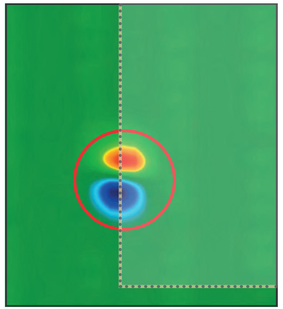
Repeat the scan and move the scan field.



Scan 2 4×4 m | 13×13 ft

Output: Signal at the edge.
Recommendation: Move the scan field.

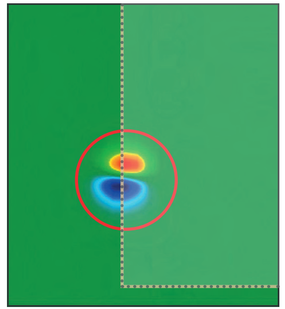
The scan field of Scan 1 was moved to the left. Some weak interference is still visible. A clear signal at the left edge – a combination of a red and a blue spot immediately next to each other – suggests a potential target object.



Scan 3 4×4 m | 13×13 ft

Output: Clear signal in the center of the scan field. Side View (see below) shows two distinct amplitudes.
Recommendation: Perform a Control Scan to verify the signal.

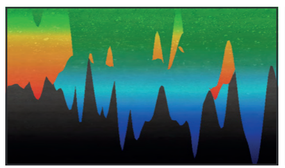
The scan field of Scan 2 was moved further toward the signal. Now the signal is perfectly centered in the scan field.

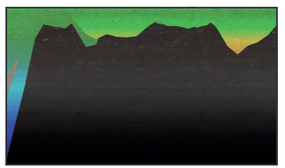


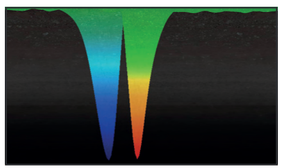
Scan 4 – Control Scan 4×4 m | 13×13 ft

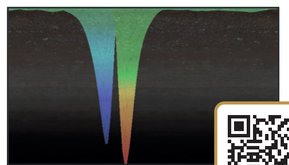
Output: Very similar signal in the same location as in the previous scan. Side View (see below) shows two distinct amplitudes.
Recommendation: Determine the depth in V3DS and excavate the target object.
Target Object: Iron tool, buried horizontally at a depth of approx. 16" (40 cm).

Scan 3 was repeated on the same scan field in the same direction. The detected signal structure is very similar and in the same location.



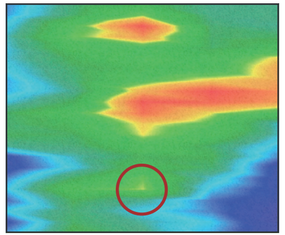






Reference: OKM eXp 5500 Scan on Field near Medieval Castle

https://service.okmdetectors.com/r/g-sa-x7-mark

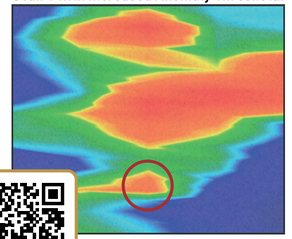


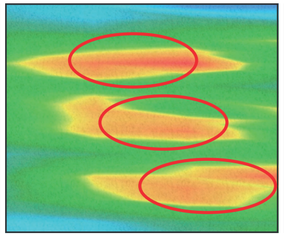
Scan 1/8 5×5 m | 16×16 ft

Output: Single orange and red signals.
Recommendation: Increase the Threshold and perform further Control Scans. Expand the size of your scan field.

The scan image shows several medium and a few weaker but still detectable signals, resembling a structure of three horizontal lines.
In V3DS, visibility can be improved by increasing the Anomaly Threshold (see image below).
At least one Control Scan is required.

Scan 1 with Increased Anomaly Threshold:

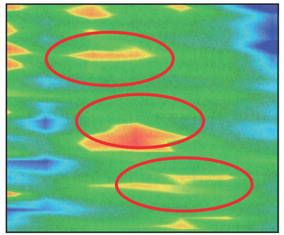




Scan 2/8 – Control Scan, rotated 180° 5×5 m | 16×16 ft

Output: Similar signal structure at the same spots as in the previous scans.
Recommendation: Expand the size of your scan field. Perform further Control Scans, compare the scans, determine the depth in V3DS, and excavate the target object(s).

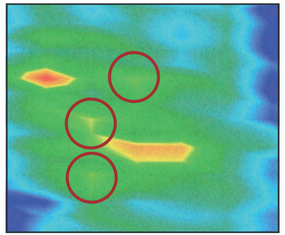
The signal structures appear similar to those in the first scans: The separate signals resemble three horizontal lines. However, in this scan, they seem slightly distorted, likely due to varying walking speeds.



Scan 7/8 – Control Scan 5×5 m | 16×16 ft

Output: Distorted signal structure, slight similarities at the same spots as in the previous scans.
Recommendation: Compare with previous scans. When scanning, pay special attention to interference signals and the correct handling of the probe.

The stripe structure shows signs of interference signals, caused by e.g. smartphone or keys close to the sensors, or the probe was held incorrectly (changing height or rotation during scanning).

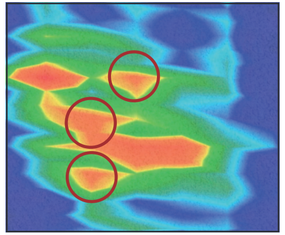


Scan 8/8 – Control Scan 5×5 m | 16×16 ft

Output: Single orange signals at the same spots verify existence of anomalies .
Recommendation: Compare with previous scans, determine the depth in V3DS, and excavate the target object(s).
Target Object: Unknown.

The scan image shows several medium and a few weaker but still detectable signals.
In V3DS, visibility can be improved by increasing the Anomaly Threshold (see image below).

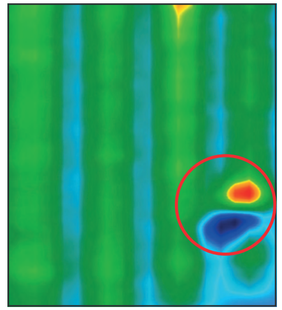
Scan 8 with Increased Anomaly Threshold:



This test field measures approx. 5×5 m (16×16 ft) and is classified with the soil type gravel. It is one of four test fields located on the OKM company premises in Altenburg, Germany. The test fields are regularly used for quality testing as well as tutorials.

The scans were performed under winter conditions (low temperatures, snow). These weather conditions do not affect magnetic field measurements.

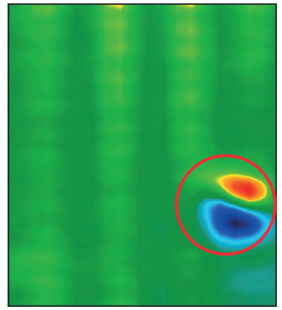
The image was taken after all control scans had been completed. In the snow, the walking paths and the resulting scan grid across the scan field are clearly recognizable, which is very helpful for understanding the scan procedure.



Scan 1 – Original Scan 5×4 m | 16×13 ft

Output: Typical signal structure for a ferromagnetic object, surrounded by striped scan structure.
Recommendation: Perform Control Scans and ignore the stripes.

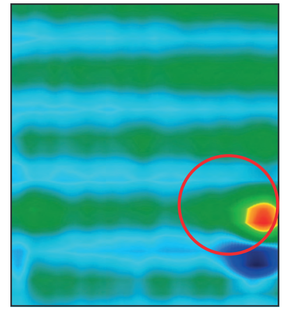
This is a typical signal structure for a ferromagnetic object, surrounded by a slightly striped scan structure. These stripes originate from improper calibration, for example when calibration is performed too close to the concrete edge, which can cause interferences. Thus, the stripes can be disregarded; the decisive factor for further ground investigation is the prominent signal structure.



Scan 2 – Control Scan 5×4 m | 16×13 ft

Output: Typical signal structure for a ferromagnetic object.
Recommendation: Dig up the target object.

The Control Scan was repeated in the same manner as Scan 1 and shows the same signal structure – with slightly less striping. The anomaly is clearly visible and appears at the same location within the scan field.



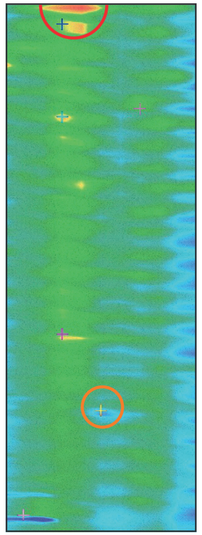
Scan 3 – Control Scan, rotated 90° 5×4 m | 16×13 ft

Output: Typical signal structure for a ferromagnetic object.
Recommendation: Dig up the target object.
Target Object: Iron plate, approx. 30×40 cm (12×16") in size, buried horizontally at a depth of approx. 30 cm (16").

The third scan was conducted on the same scan field, but rotated by 90 degrees.

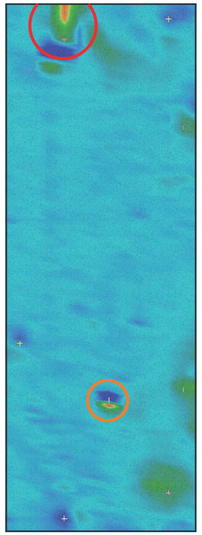
The stripes are much more prominent but can still be disregarded. However, the striping clearly indicates the scan direction within the scan field.

The signal structure detected in the previous scans is clearly recognizable again, showing the same intensity and position within the scan field.



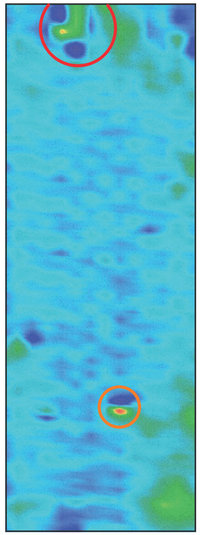
Scan 1 | Fusion Light
22x8 m | 72x26 ft

Output: Striped structure with several weak signals and a stronger signal at the upper edge of the scan field.
Recommendation: Perform Control Scans to verify the potential target signals. Move the scan field to see the target signal at the upper edge more clearly.



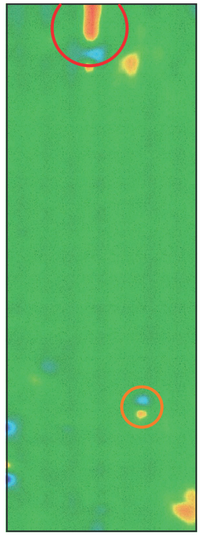
Scan 2 | Rover C4 with Super Sensor
22x8 m | 72x26 ft

Output: Combination of blue and red signal side by side, in the center and at the upper edge – same locations as in Scan 1.
Recommendation: Perform Control Scans to verify the potential target signals. Move the scan field to determine the size of the potential target signal at the upper edge.



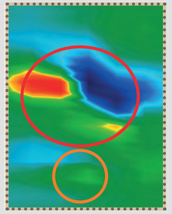
Scan 3 | eXp 5500 with Super Sensor
22x8 m | 72x26 ft

Output: Combination of blue and red signal side by side, in the center and at the upper edge – very similar to the previous scans.
Recommendation: Move the scan field to determine the size of the potential target signal at the upper edge.



Scan 4 | eXp 5500 with SuperSense System (5 sensor pairs side by side)
22x8 m | 72x26 ft

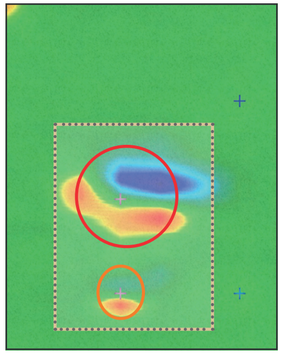
Output: Combination of blue and red signal side by side, in the center and at the upper edge – very similar to the previous scans.
Recommendation: Move the scan field to determine the size of the potential target signal at the upper edge.



Scan 5 | Fusion Light
4x3 m | 13x10 ft

Output: The scan shows a clear signal structure in the center, with blue and red spots clearly distinguishable. Next to it, another very weak signal structure can be recognized.
Recommendation: Perform Control Scans and increase the scan field dimensions for more surrounding scan values.

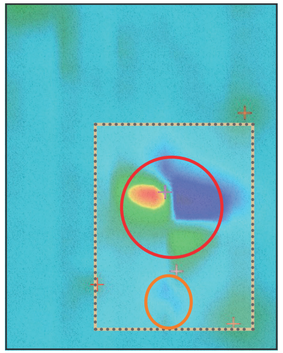
In the previous large-scale scans (1 to 4), a distinctive signal structure was detected at the upper edge of the scan field. The scan field for the current scan was adjusted accordingly in order to analyze this signal structure more precisely.



Scan 6 | eXp 5500 with Super Sensor
8x6 m | 26x20 ft

Output: The scan shows a clear signal structure in the center with blue and red spots. The weaker signal structure next to it is more clearly visible than in Scan 5.
Recommendation: Perform another Control Scan and excavate the target object.

Scan field 5 was expanded to achieve more precise results. The prominent signal structure appears at the same location as in the previous scans. The weaker adjacent signal is also slightly more visible.

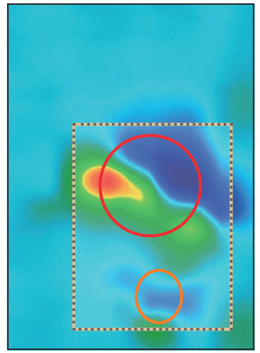


Scan 7 | eXp 5500 with SuperSense System (5 sensor pairs side by side)
8x6 m | 26x20 ft

Output: The scan shows a clear signal structure in the center with blue and red spots. Next to it, a weaker signal structure is visible.
Recommendation:
Excavate the target object.

The same scan was repeated using the SuperSense System (five sensor pairs operating simultaneously side by side). The signal structure – a red and blue spot – was detected at the same location within the scan field.

The detected reference object was not excavated immediately, but left in the ground for further test scans with the eXp 7000 using the SuperSense System (seven sensor pairs simultaneously side by side).

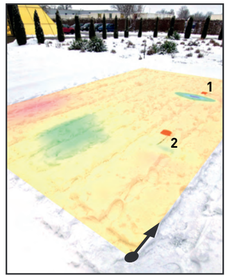


Scan 8 | eXp 7000 with SuperSense System (7 sensor pairs side by side)
8x5 m | 26x16.4 ft

Output: The scan shows a clear signal structure in the center. Next to it, the weaker signal structure is more clearly visible than in previous scans.
Recommendation: Dig up the target object.
Target Object: Iron bucket, rusted, filled with soil, buried horizontally at a depth of approx. 45 cm (18").

This Control Scan was performed with the eXp 7000 using the SuperSense System. Due to a time delay of several weeks, the scan field is positioned slightly offset.

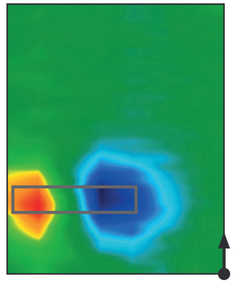
The signal structure is clearly recognizable at the same location within the scan field, and the adjacent weak signal is now much more visible.



This test field measures approx. 5×5 m (16×16 ft) and is classified with a sandy soil type. It is one of four test fields located on the OKM company premises in Altenburg, Germany. The test fields are regularly used for quality testing as well as tutorials.

The scans were performed under winter conditions (low temperatures, snow). These weather conditions do not affect magnetic field measurements.

The image was taken after all control scans had been completed. In the snow, the walking paths and the resulting scan grid across the scan field are clearly recognizable, which is very helpful for understanding the scan procedure.



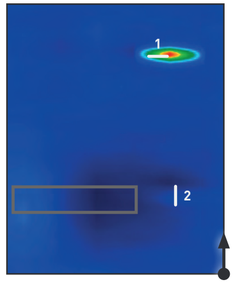
Scan 1 – Original Scan
5×4 m | 16×13 ft

Output: Significant large combined red-blue signal structure in the lower area.
Target: Steel-GRP gas pipeline, ⌀ 19 cm | 7.7", depth: 80 cm | 32"

To demonstrate how multiple objects within a single scan field affect the scan result, a test scan series consisting of four scans in total was performed.

Scan 1 was performed on the original test field. In the final scan image, a large red–blue signal signature is clearly visible. This signature corresponds to the steel pipe buried at a depth of 80 cm (32").

After Scan 1 was completed, the scan field was modified by adding two objects on the surface: marker flags with steel rods. One was positioned perpendicular to the scan direction (1), while the other was aligned parallel to the scan lines (2).

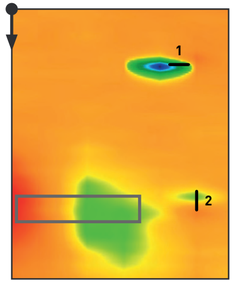


Scan 2 – Control Scan
on modified field (incl. 2 marker flags)
5×4 m | 16×13 ft

Output: A distinct red signal (with faint blue pole to its left) in the upper part, accompanied by a faint shadow-like structure in the lower area of the scan field.
Recommendation: Review the scan image during the scan (ideally after each scan line) or afterward using the *Replay* function on the Control Unit, if available.

The dominant red signal originating from the positive pole of marker flag 1 overshadows the other two targets: Both the larger, stronger pipe located at greater depth and marker flag 2 are masked by this dominant signal of marker flag 1.

In addition to the dominant signal, a very faint blue signal is visible to its left, representing the opposite pole.

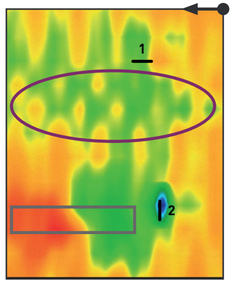


Scan 3 – Control Scan, rotated 180°,
on modified field (incl. 2 marker flags)
5×4 m | 16×13 ft

Output: A distinct blue signal (with faint red pole to its right) in the upper part, accompanied by a faint shadow-like structure in the lower area of the scan field.
Recommendation: Review the scan image during the scan (ideally after each scan line) or afterward using the *Replay* function on the Control Unit, if available.

The dominant blue signal originating from the negative pole of marker flag 1 also masks the other two targets: However, both the larger, deeper pipe and marker flag 2, which is located between the scan lines, are still more clearly visible in this scan.

This control scan was performed with 180° rotation relative to the other two scans. For easier analysis, the scan image was rotated back to its original orientation.



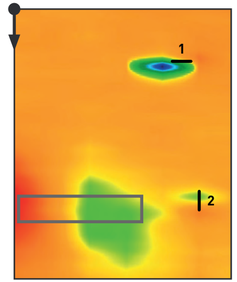
Scan 4 – Control Scan, rotated 90°,
on modified field (incl. 2 marker flags)
4×5 m | 13×16 ft (rotated for comparison)

Output: Distorted scan image with interference patterns, a prominent blue signal at marker flag 2, and a faint shadow-like red-green structure.
Recommendation: Repeat the scan with higher accuracy.

In this scan, due to the 90° rotation of the scan field, marker flag 2 was detected and masks the target signal of the pipe. Marker flag 2 is completely missed between the scan lines.

The interference pattern is caused by errors in the scanning technique: In scan lines 4 to 6, the starting points were not positioned consistently. As a result, scan values that should align are shifted forward and backward, creating visible discontinuities in the scan image.

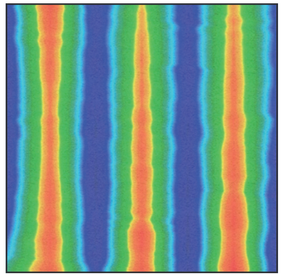
This scan was performed in East-West direction, causing less accurate results.



Scan 3 – Control Scan, rotated 180°,
on modified field (incl. 2 marker flags)
5×4 m | 16×13 ft

Output: Clean scan image, a prominent blue signal at marker flag 1, and a faint shadow-like red-green structure.
Recommendation: If elongated objects are expected, always scan the area from two different angles.

This scan was performed in North-South direction, a different direction than Scan 4. As a result, marker flag 1 becomes visible due to the fact that the scan lines cross it, while marker flag 2, which is aligned parallel to the scan lines, is almost missed.

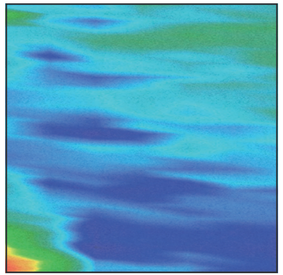


Scan 1
5×5 m | 16×16 ft

Output: Vertically striped structure.
Recommendation: Repeat the scan using the correct scan direction, ensuring both walking direction and probe direction are consistent.

According to the *Characteristics*, the scan was performed in *Scan Mode Parallel*. After clarification with the user, the scan field was actually traversed in *Zigzag*, while the probe was held in a fixed orientation throughout the scan. This means that the probe was pointing in the wrong direction on every second scan line – see ***6.5.4 Vertically Striped on page 43***.

Repeat the scan using the correct scanning technique.



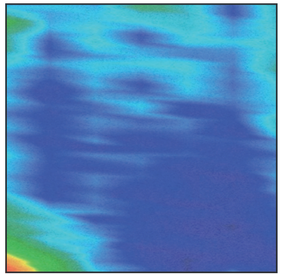
Scan 2 – Control Scan in Parallel Mode
5×5 m | 16×16 ft

Output: Calm scan field with strong signal at the edge (bottom left corner).
Recommendation: Move the scan field to position the prominent signal in its center and determine the size of the target signal.

According to the *Characteristics*, the scan was performed in *Scan Mode Parallel*, this time correctly.

The scan field appears calm, with no prominent signals in the center.

A strong signal is present in the bottom left corner of the scan field. To obtain more detailed information about its size and structure, move the scan field so that this signal is positioned in its center.



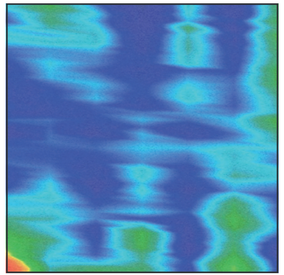
Scan 3 – Control Scan in Zigzag Mode
5×5 m | 16×16 ft

Output: Calm scan field with strong signal at the edge (bottom left corner).
Recommendation: Move the scan field to position the prominent signal in its center and determine the size of the target signal.

According to the *Characteristics*, the scan was performed in *Scan Mode Zigzag*, this time correctly.

The scan field appears calm, with no significant signals in the center. A strong signal is present in the bottom left corner of the scan field, confirming the results of Scan 2.

Move the scan field to get more detailed information about the size and structure of the prominent signal.



Scan 1 modified in V3DS
5×5 m | 16×16 ft

Output: Strong signal at the edge (bottom left corner).
Recommendation: Repeat the scan with correct scanning technique. Move the scan field to position the prominent signal in its center and determine the size of the target signal.

After evaluating the scan result of Scan 1, control scans were performed. For comparison, the *Rotational Correction* modifier was applied to the measurement data of Scan 1 (see image above). The resulting scan image appears similar to the control scans.

However, perform scans correctly. This is always recommended to achieve clearer and more reliable results.

OKM

NOTES

OKM DETECTORS

HEADQUARTERS

OKM GmbH
Julius-Zinkeisen-Str. 7
04600 Altenburg
Germany

SUBSIDIARY

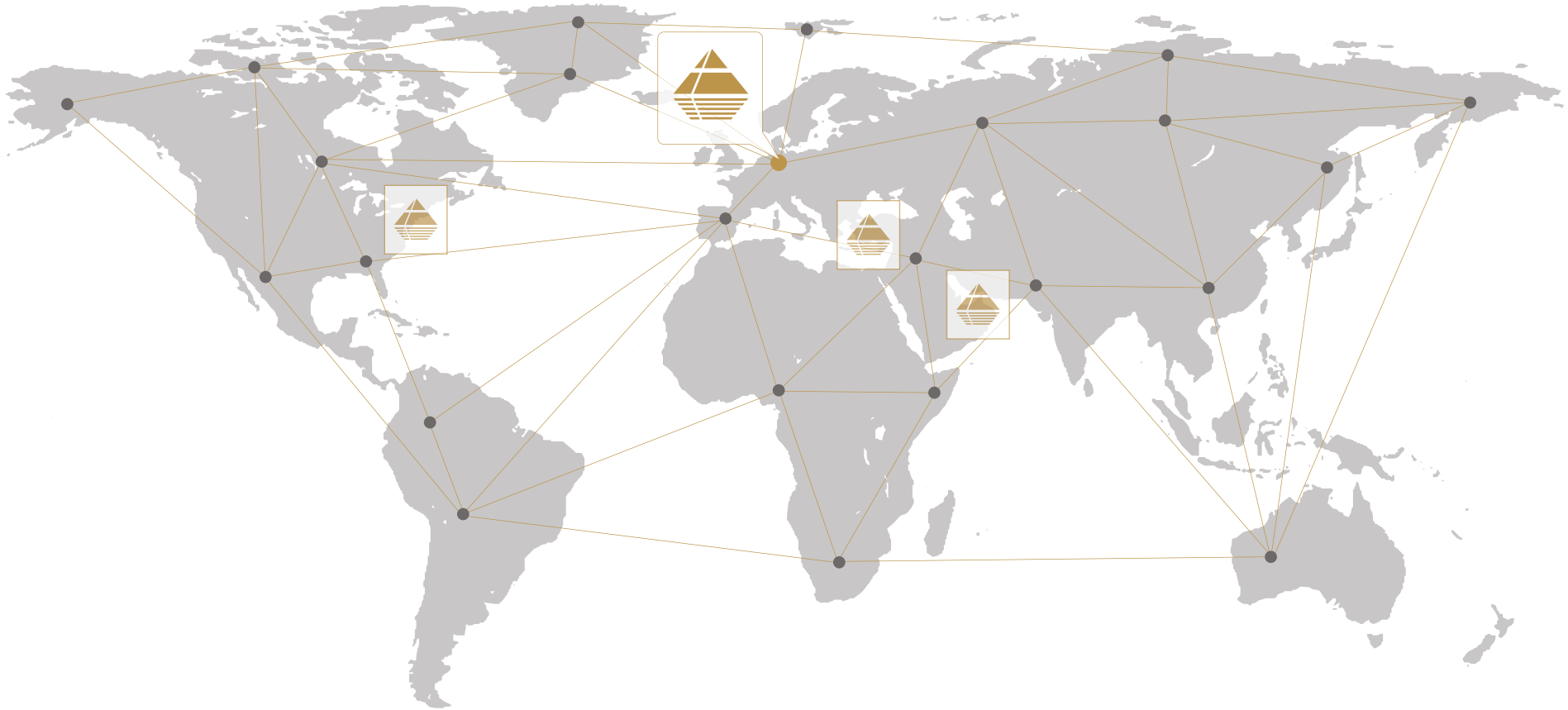
OKM Americas
Charlotte
USA

SUBSIDIARY

OKM Türkiye
Antalya
Türkiye

SUBSIDIARY

OKM Emirates FZE
SAIF Zone, Sharjah
UAE



+49 3447 499 3000 +49 162 419 2147 info@okmdetectors.com www.okmdetectors.com