



Vortrag

Donnerstag, 1. Oktober 2026, 12:30 Uhr

Fortschritte bei Walk-Over Systemen: Von der KI-Integration bis zu hochpräzisen Geopositionierung

Vortragende: Renzo Chirulli, Bjorn Van de Weghe und Yusuf Başaran
Digital Control GmbH (DCI)

Lecture

Thursday, 1st October 2026, 12:30 pm

Advancements in Walk-Over Locating Systems: From AI Integration to High Accuracy Geopositioning

Speakers: Renzo Chirulli, Bjorn van de Weghe
and Yusuf Başaran
Digital Control GmbH (DCI)

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Advancements in Walk-Over Locating Systems: From AI Integration to High Accuracy Geopositioning

Renzo Chirulli Territory Manager Mediterranean Region, DCI
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Digital Control Inc.

The HDD industry faces a growing shortage of skilled personnel, creating a need for technologies that simplify operations and reduce training requirements. Recent advances in walk-over guidance systems, including AI-driven frequency optimization and one-click calibration, have significantly reduced operator dependency while improving accuracy and ease of use.

Combined with scalable power management, down-the-hole bore pressure measurement, integration with high-precision GNSS and Logging While Drilling (LWD) software, modern walk-over systems can now support deeper and longer installations while providing accurate bore mapping and documentation. These innovations are expanding the operational range of walk-over technology, reducing training time, and helping the HDD industry address workforce and productivity challenges.

Introduction

The shortage of new personnel willing to work in the HDD industry is a challenge felt across Europe. This workforce constraint prevents many companies from expanding the number of operational crews and, consequently, the size of their drilling fleets, despite the growing demand for installations performed using Horizontal Directional Drilling (HDD).

If the pool of available candidates remains insufficient or continues to shrink, technology can and must play a crucial role in simplifying traditionally complex operations and significantly reducing the learning curve required to operate HDD systems effectively.

This approach can be applied to all subsystems that make up HDD technology, and particularly to walk-over guidance systems.



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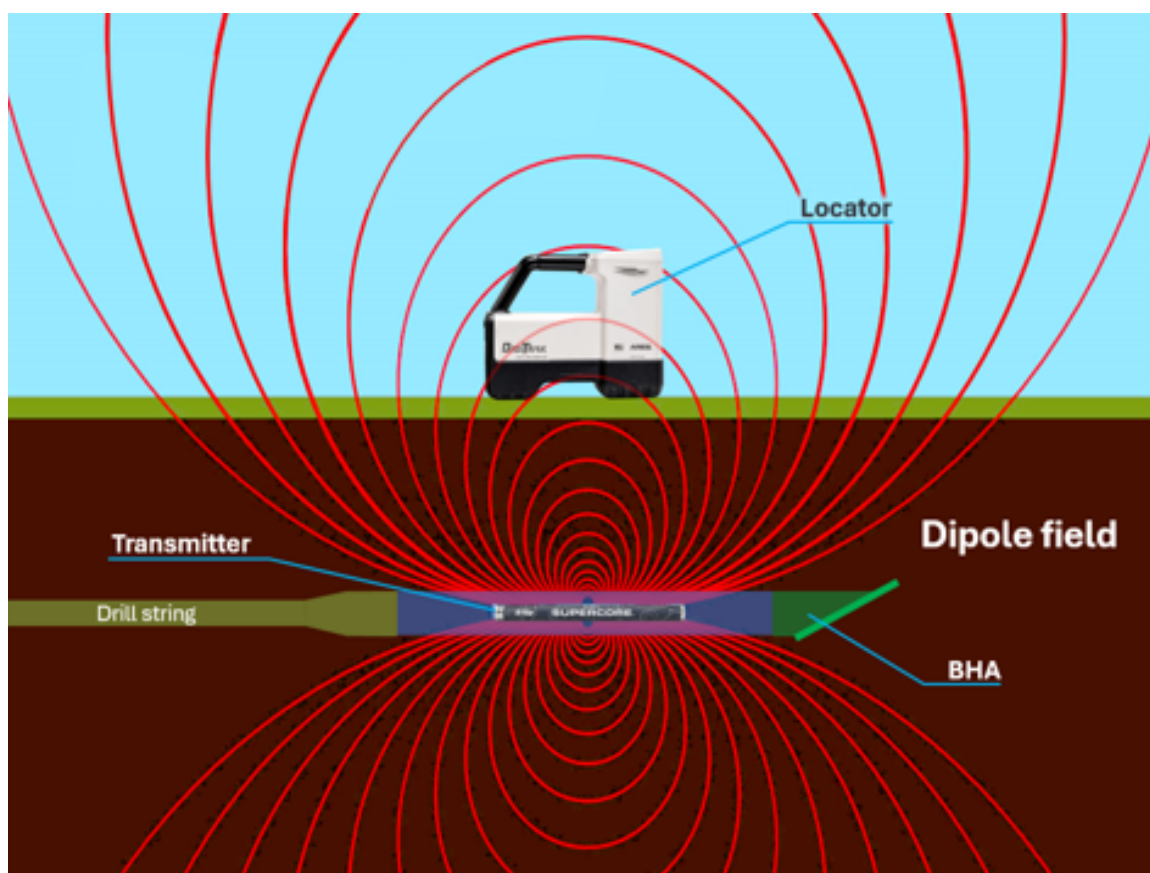
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Making complex operations simple.

Walk-over systems are based on the detection of characteristic points within the electromagnetic field generated by a downhole transmitter. The signal emitted by the transmitter is detected by a surface receiver, commonly referred to as a locator, enabling the determination of the transmitter's horizontal position and direction and, consequently, the position and direction of the drill head to which the transmitter is attached. The locator also determines the transmitter's magnetic depth. In addition, onboard transmitter sensors measure inclination, orientation (clock or tool face), transmitter temperature, and annular drilling fluid pressure at the bottom of the hole.



Data acquired by the onboard sensors are digitally transmitted to the receiver and made available to the operator, while the characteristic points of the electromagnetic field generated by the transmitter are independently detected by the receiver.

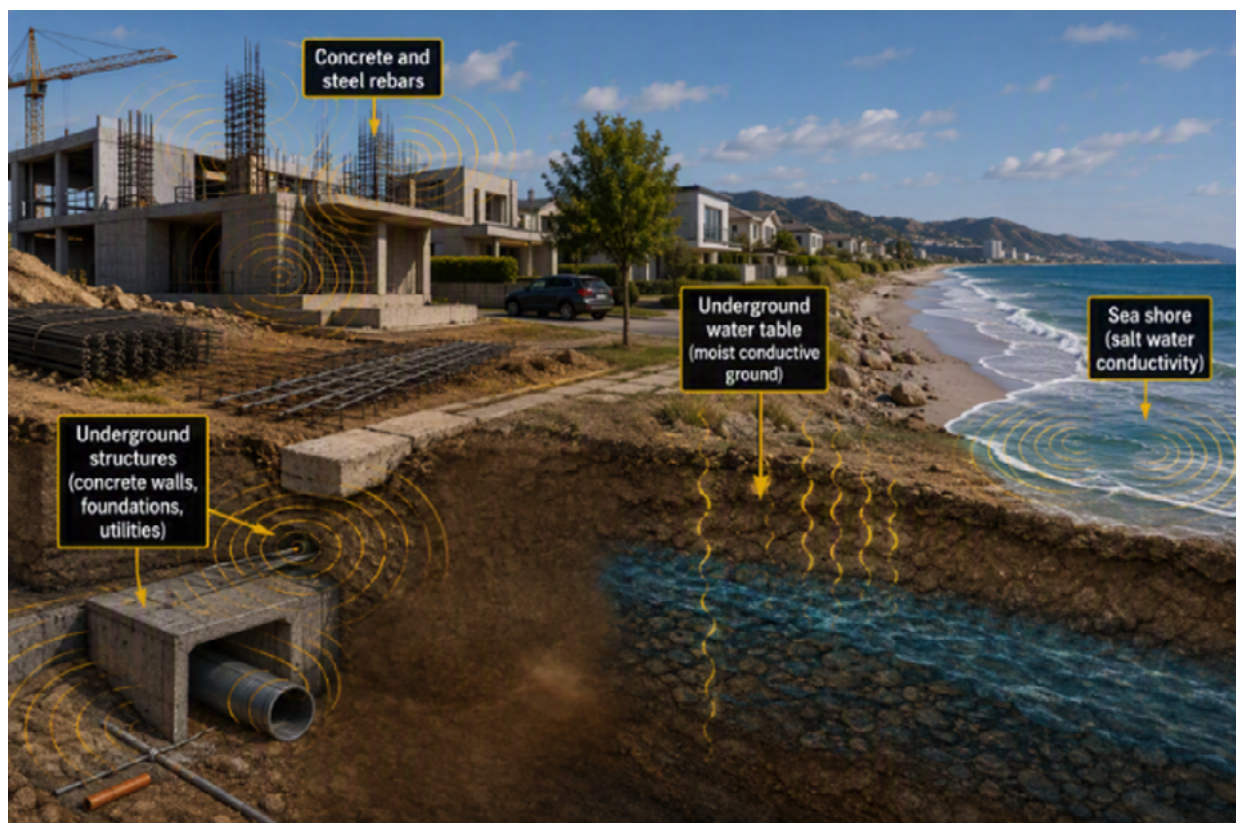
By their very nature, the electromagnetic fields generated by transmitters are susceptible to two classes of interference: active interference, consisting of electromagnetic fields generated by other active sources, and passive interference, produced by objects possessing magnetic properties, such as rebar, metallic masses, conductive soils, seawater, or brackish water.

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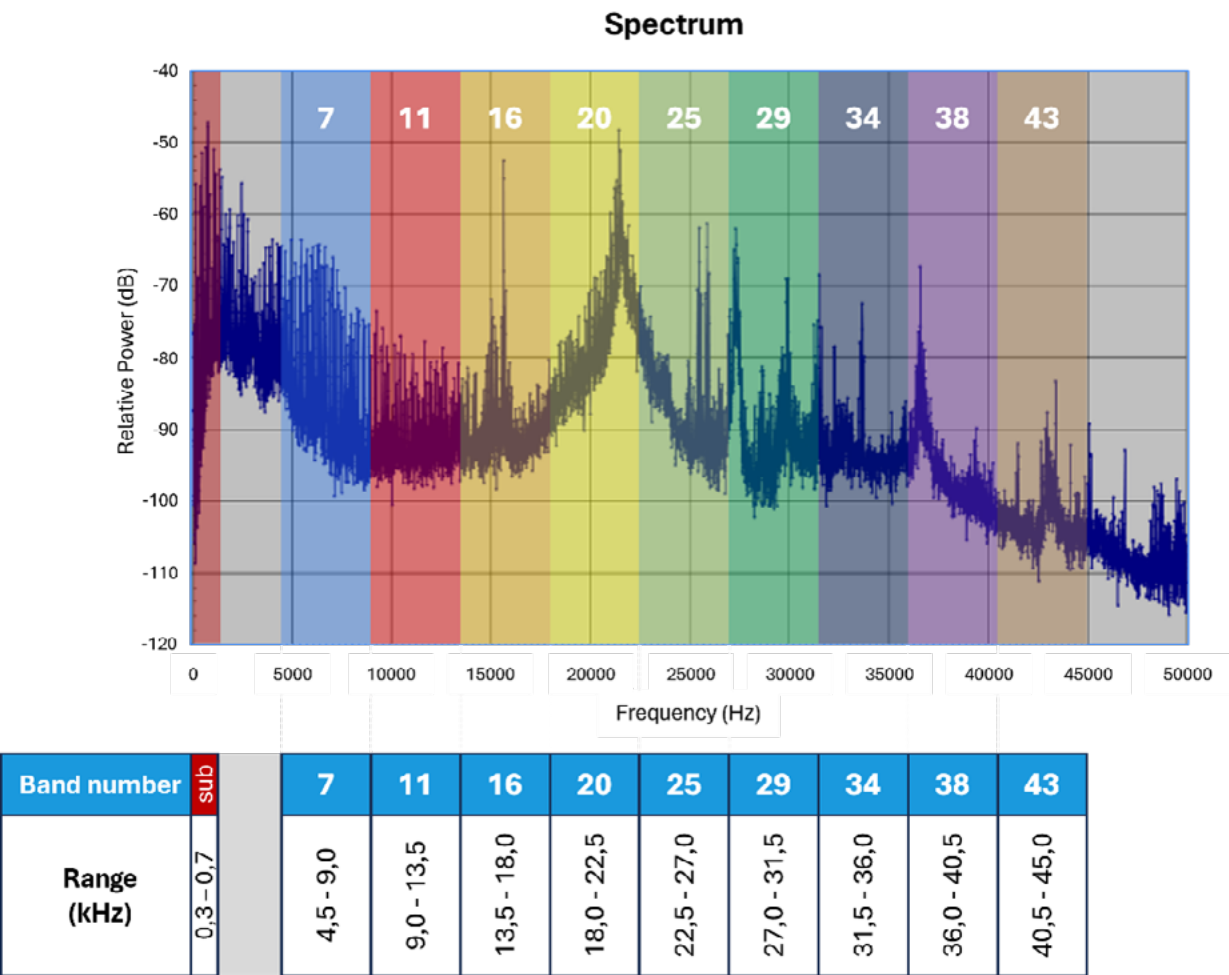
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Modern walk-over guidance systems can mitigate the effects of both active and passive interference. This is achieved primarily through the ability to vary the frequencies of the signals generated by the transmitter. Early walk-over systems lacked this capability.

Today, the most advanced systems operate across more than 8,000 selectable frequencies spanning a range from 0.3 kHz to 45 kHz, enabling true optimization of operating frequencies.

In practical terms, the system can identify the most suitable operating frequencies for a specific job site after analyzing the spectrum of electromagnetic noise generated by active interference sources and assessing potential passive interference conditions.



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Although this technology has been available for several years and has significantly expanded the operational capabilities of walk-over systems, manual frequency optimization remains relatively complex and unintuitive, relying heavily on the operator's knowledge and experience.

As a result, the learning curve has traditionally been substantial, often requiring significant time before an operator becomes fully proficient in system configuration and operation.

Following frequency optimization, the next essential procedure is calibration, which consists of associating a specific depth with the corresponding consistent signal strength emitted by the transmitter when installed in the transmitter housing. Calibration also involves a certain degree of complexity.

Without adequate knowledge and experience, operators may perform this procedure only partially or omit it entirely, significantly compromising system accuracy under the specific conditions encountered at the job site.

These critical processes, which are essential for ensuring system performance under a wide range of interference conditions, have now become significantly faster and easier through the integration of Artificial Intelligence (AI) directly into the system hardware. As a result, frequency optimization has become an automated operation which leads to better frequency selection, while still allowing operators to perform manual frequency selection when specific circumstances require a more advanced approach.

Furthermore, calibration has been reduced to a one-click procedure during which two different frequency bands and three distinct power levels can be calibrated in less than 40 seconds.



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These innovations have transformed two of the most important operations required to achieve high system accuracy into straightforward procedures. As a result, even relatively inexperienced operators can configure the system in a matter of minutes with a level of effectiveness comparable to that of experienced personnel.

Consequently, the learning curve associated with system operation has been dramatically reduced, making it possible to onboard new operators within only a few days.

Extending the range of applications.

One of the defining characteristics of walk-over systems is that signal and data transmission are performed wirelessly. An exception is represented by cable transmitters, whose use is limited to approximately 1% of applications and therefore cannot be considered representative of the technology.

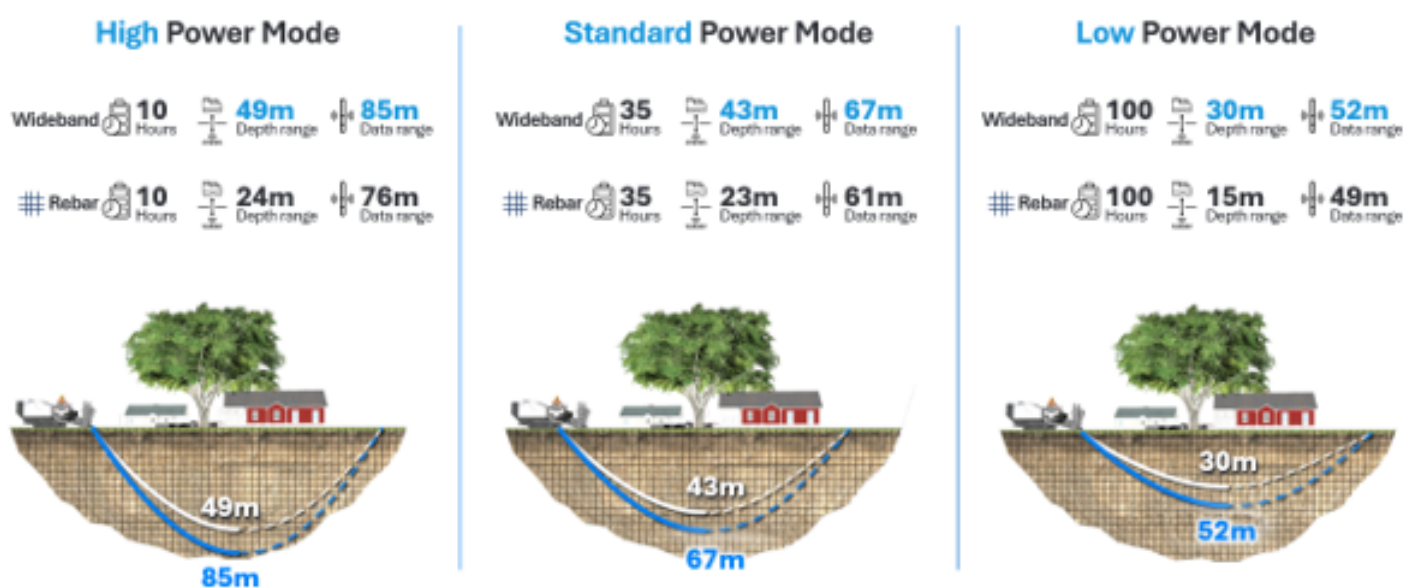
Wireless transmission of signals and data offers significant advantages over wireline guidance systems, including MGS, GST, and combined solutions. It reduces drilling time during pilot bore execution and eliminates problems associated with data transmission interruptions caused by damaged cables or connectors.

The trade-off associated with wireless transmission is that signal strength depends, among other factors, on transmission power, which is ultimately constrained by the capacity of the batteries powering the transmitter.

Optimizing transmission power according to site conditions contributes directly to maximizing battery life. For this reason, modern walk-over systems typically operate with at least three different power levels. By combining frequency optimization with scalable power settings, it is possible to optimize the balance between system effectiveness and accuracy on one side and battery autonomy on the other, substantially extending the operational range of walk-over systems.

While early generations of this technology were limited in both depth and distance, modern walk-over systems can now achieve depths exceeding 40 meters and bore lengths of up to 600 meters using a single battery. Maximum bore length can be further increased using two or more transmitters operating in tandem.

These capabilities have enabled the use of walk-over systems in applications that were once considered suitable only for wireline guidance systems, delivering substantial advantages in terms of ease of use as well as acquisition and operating costs, which remain significantly lower than those associated with wireline technologies.



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Accurate bore mapping.

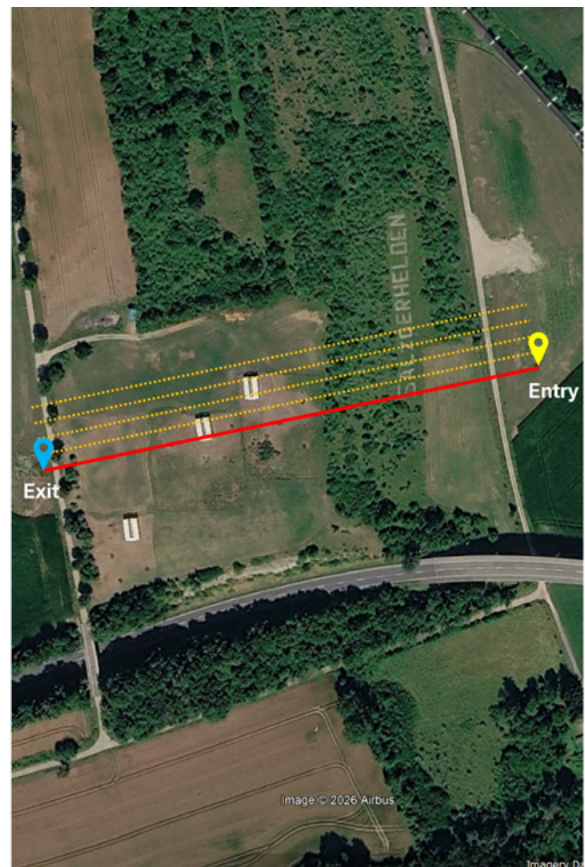
Another important feature of modern walk-over systems is the increasingly close integration between the locator and GNSS (Global Navigation Satellite System) technology. While not entirely new, since the first walk-over systems equipped with standard GPS receivers were introduced approximately ten years ago, advances in GNSS technology are now driving the integration of high-accuracy positioning systems with locators for highly accurate pilot bore mapping.

It is becoming increasingly common for project owners and contracting authorities to require pilot bore mapping based on geographic coordinates measured by a high-accuracy GNSS system integrated with the locator, combined with depth data collected during drilling operations.

The transfer of positional data to dedicated Logging While Drilling (LWD) software not only enables the immediate generation of drilling records in a format that is easily interpreted by both contractors and project owners but also paves the way for the development of new functionalities in future walk-over systems, further enhancing their flexibility, operational efficiency, and overall effectiveness.

Case history #1

- › **Where:** Salzderhelden, Göttingen, Germany
- › **When:** June 2025
- › **What:** Power transmission lines for wind farms - Five parallel bores, each with a depth of up to 41 m
- › **Soil:** Sandstone (UCS = 50 MPa, RQD = 60%)
- › **Required accuracy:** 10%
- › **Notes:** This successful test saved the customer more than EUR 60,000



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BORE#1

Length: 285 m

Max depth: 39 m

Duration: 4 days

Notes:

- Single slot Rockmaster
- Salzderhelden hill, 33 m difference in elevation
- Never lost the signal during the entire bore



BORE#2

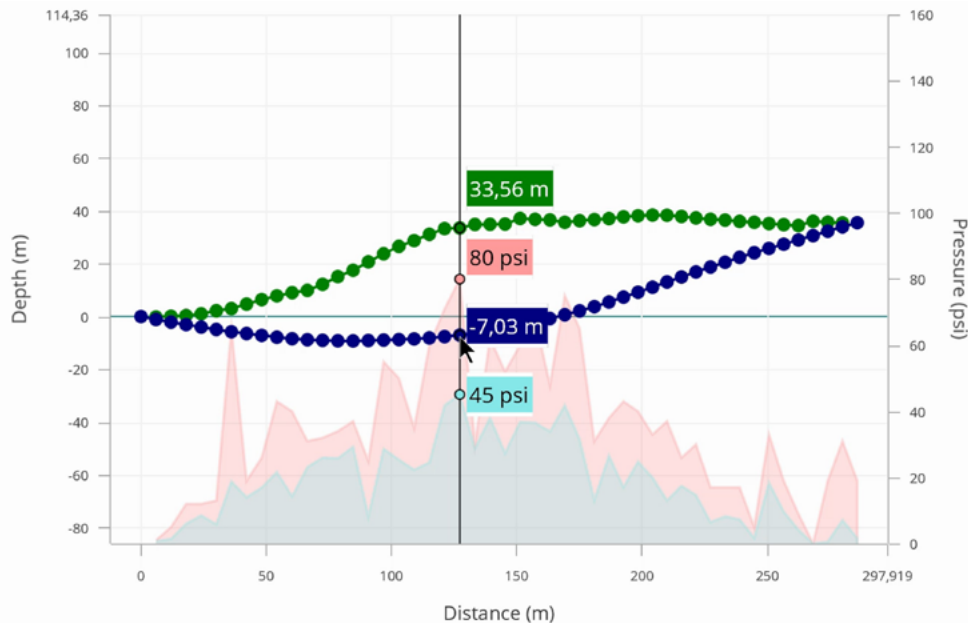
Length: 285 m

Max depth: 41 m

Duration: 4 days

Notes:

- 2-slot housing, with lower signal degradation
- The new rechargeable battery provided 11 hrs in high power mode
- Never lost the signal during the entire bore



Rod Number

21

Type

Locate Line

Pitch

11,0%

Depth

40,59 m

Terrain Height

33,56 m

Relative Depth

-7,03 m

Position from Entry

COMPETITIVE EDGE

- Accuracy requirements were consistently achieved without difficulty
- Could go as deep as needed
- All this with a 15" transmitter – no additional transmitter-housing costs

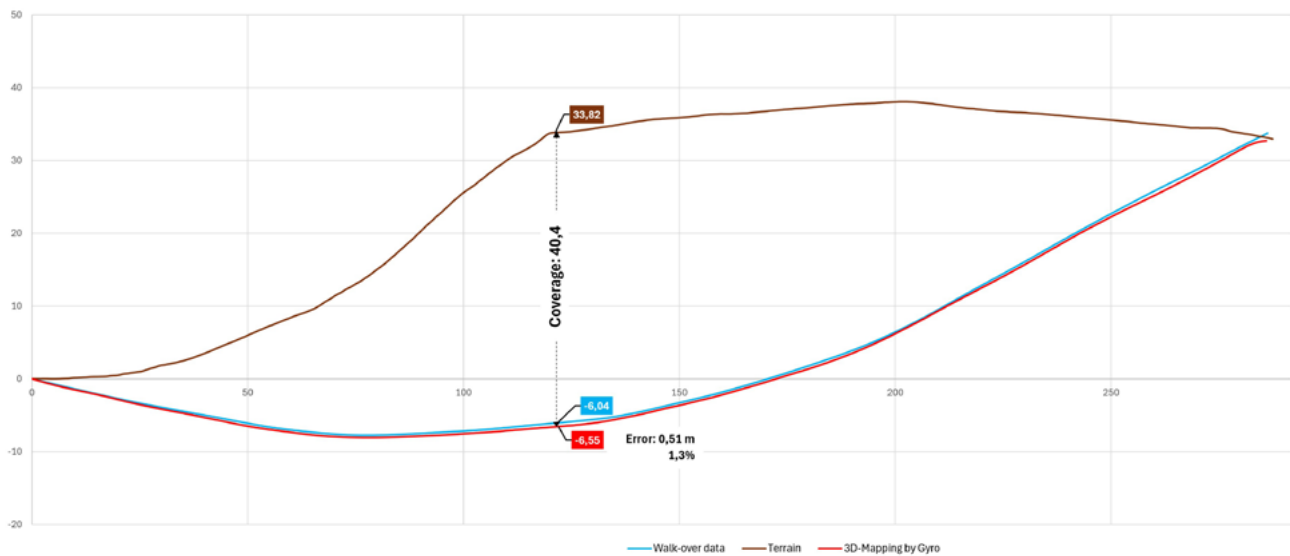
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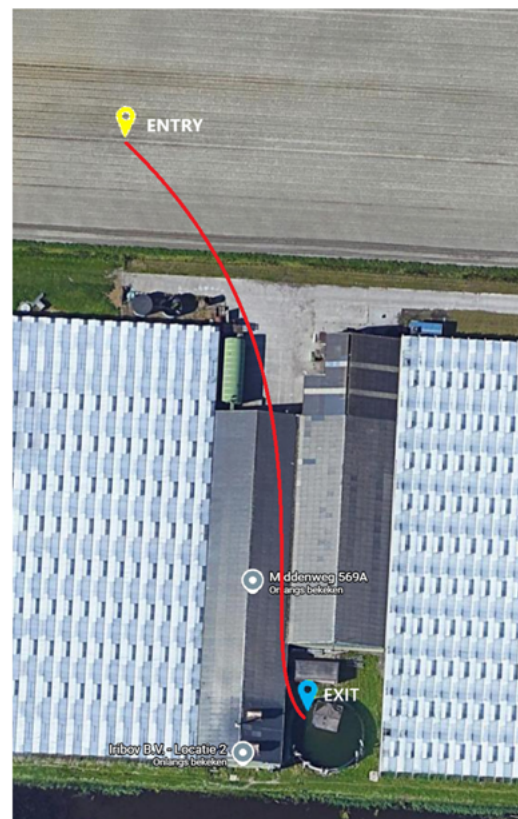


ACCURACY

- › 0,51 m over 40,4 m of coverage → 1.3% error in depth

Case history #2

- › **Where:** Iribov BV, Heerhugowaard, The Netherlands
- › **When:** 25 March 2026
- › **What:** Power distribution lines for an on-site connection – within 10 cm from the power connection of an existing pump
- › **Interference:** high power electricity cabin, greenhouse, production area, reinforced concrete floors and walls, underground brackish water
- › **Soil:** clay
- › **Required accuracy:** 10 cm maximum from the connection of the basin pump
- › **Notes:** This successful bore saved the customer the rental of a gyro

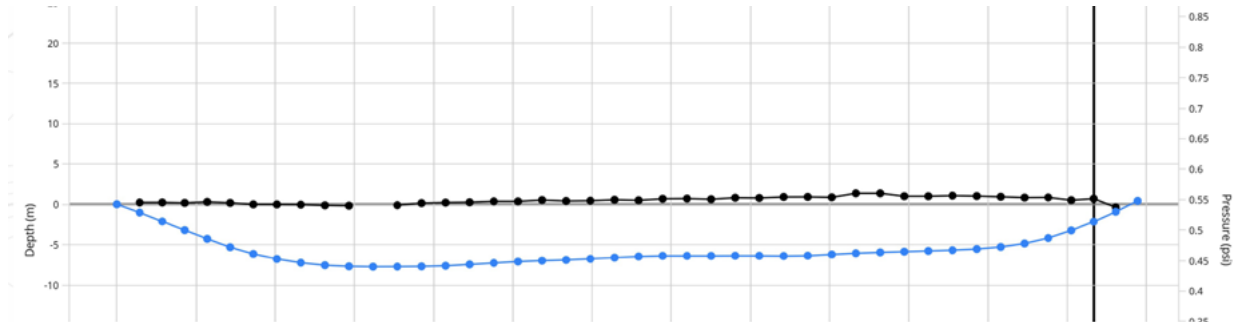


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Drill Data Points Summary

FLP(Front Locate) - LL(Locate Line) - PO(Pitch Only) - BL(No Data)

Removed Hidden Added Edited

Rod ID	Pitch	Depth	X Distance	Reading Type	Bore Length
0	-33.6%	0.00 m	0.00 m	PO	0.00 m
1	-37.4%	1.24 m	2.87 m	LL	3.05 m
2	-40.3%	2.35 m	5.72 m	LL	6.10 m
3	-36.6%	3.39 m	8.56 m	LL	9.15 m
4	-38.5%	4.58 m	11.42 m	LL	12.20 m
5	-33.4%	5.49 m	14.29 m	LL	15.25 m
6	-23.3%	6.14 m	17.22 m	LL	18.30 m
7	-18.7%	6.76 m	20.21 m	LL	21.35 m
8	-12.3%	7.20 m	23.22 m	LL	24.40 m
9	-8.1%	7.43 m	26.26 m	LL	27.45 m
10	-1.1%	7.52 m	29.30 m	LL	30.50 m
11	-1.7%	--	32.35 m	PO	33.55 m
12	+2.3%	7.62 m	35.40 m	LL	36.60 m
13	-0.6%	7.85 m	38.45 m	LL	39.65 m
14	+5.6%	7.84 m	41.50 m	LL	42.70 m
15	+5.5%	7.71 m	44.55 m	LL	45.75 m
16	+6.2%	7.64 m	47.59 m	LL	48.80 m
17	+5.4%	7.46 m	50.64 m	LL	51.85 m
18	+2.1%	7.51 m	53.69 m	LL	54.90 m

19	+3.8%	7.31 m	56.73 m	LL	57.95 m
20	+5.1%	7.20 m	59.78 m	LL	61.00 m
21	+4.8%	7.17 m	62.83 m	LL	64.05 m
22	+4.4%	6.96 m	65.87 m	LL	67.10 m
23	+0.8%	7.07 m	68.92 m	LL	70.15 m
24	-1.0%	7.10 m	71.97 m	LL	73.20 m
25	+0.9%	7.02 m	75.02 m	LL	76.25 m
26	+0.2%	7.18 m	78.07 m	LL	79.30 m
27	-0.6%	7.16 m	81.12 m	LL	82.35 m
28	-1.1%	7.31 m	84.17 m	LL	85.40 m
29	+3.6%	7.28 m	87.22 m	LL	88.45 m
30	+6.5%	7.08 m	90.27 m	LL	91.50 m
31	+3.6%	7.42 m	93.31 m	LL	94.55 m
32	+3.4%	7.31 m	96.36 m	LL	97.60 m
33	+2.7%	6.86 m	99.41 m	LL	100.65 m
34	+3.1%	6.77 m	102.46 m	LL	103.70 m
35	+3.0%	6.75 m	105.51 m	LL	106.75 m
36	+6.4%	6.56 m	108.56 m	LL	109.80 m
37	+10.5%	6.21 m	111.59 m	LL	112.85 m
38	+17.9%	5.68 m	114.61 m	LL	115.90 m
39	+27.3%	5.03 m	117.59 m	LL	118.95 m
40	+37.4%	3.75 m	120.49 m	LL	122.00 m
41	+39.4%	2.84 m	123.34 m	LL	125.05 m
42	+49.6%	0.53 m	126.13 m	LL	128.10 m
43	+47.7%	--	128.87 m	PO	131.15 m

▼ Log summary				Type
# of rods				Pitch Only
Total bore distance		128.87 m		Pitch -33.6%
Maximum bore depth		7.85 m		Depth
Rod	Pitch	Depth	Distance	
0	-33.6%	--	0.00 m	Terrain Height
1	-37.4%	1.24 m LL	2.87 m	--
2	-40.3%	2.35 m LL	5.72 m	Relative Depth
3	-36.6%	3.39 m LL	8.56 m	0.00 m
4	-38.5%	4.58 m LL	11.42 m	Position from Entry
5	-33.4%	5.49 m LL	14.29 m	0.00 m
6	-23.3%	6.14 m LL	17.22 m	Bore Length
7	-18.7%	6.76 m LL	20.21 m	0.00 m
8	-12.3%	7.20 m LL	23.22 m	
9	-8.1%	7.43 m LL	26.26 m	
10	-1.1%	7.52 m LL	29.30 m	
11	-1.7%	--	32.35 m	
12	+2.3%	7.62 m LL	35.40 m	

Data Point Info

Comment

Rod Length 0.00 m

Timestamp 25-Mar-2026 12:12 PM

Fluid Pressure

Rod	Pitch	Depth	Distance	
31	-3.6%	7.42 m LL	93.31 m	Terrain Height
32	-3.4%	7.31 m LL	96.36 m	--
33	-2.7%	6.86 m LL	99.41 m	Relative Depth
34	-3.1%	6.77 m LL	102.46 m	0.42 m
35	+3.0%	6.75 m LL	105.51 m	Position from Entry
36	-6.4%	6.56 m LL	108.56 m	128.87 m
37	+10.5%	6.21 m LL	111.59 m	Bore Length
38	+17.9%	5.68 m LL	114.61 m	131.15 m
39	+27.3%	5.03 m LL	117.59 m	
40	+37.4%	3.75 m LL	120.49 m	
41	+39.4%	2.84 m LL	123.34 m	
42	+49.6%	0.53 m LL	126.13 m	
43	+47.7%	--	128.87 m	

Data Point Info

Comment

Rod Length 3.05 m

Timestamp 25-Mar-2026 3:31 PM

Fluid Pressure

COMPETITIVE EDGE

- ▶ Rebar frequency was giving accurate depth readings
- ▶ No interference from the high-power electricity cabin due to AI optimization
- ▶ No expensive tooling needed, fast setup/drill time, 3h15m, lunch included
- ▶ All this with a walk over system – traditionally the customer would use gyro steering in these conditions due to the high failure rate with traditional walk over systems.