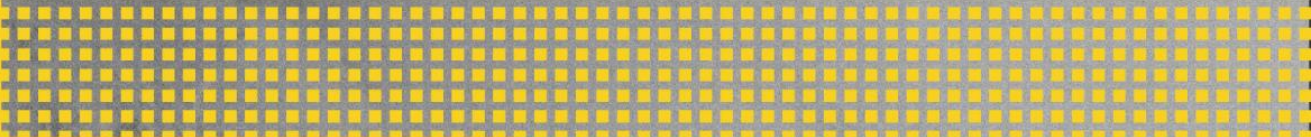




mae

Geoelectric prospecting



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HIGH-RESOLUTION ELECTRICAL RESISTIVITY TOMOGRAPHY

Abstract

Since the first ERT instruments were produced in the 1950s, geologists have used them to map underground coal deposits and other geological formations. With each new iteration of this technology, new applications have emerged, from groundwater analysis to building surveying and use in archaeology.

But one thing hasn't changed: more measurement points are critical for accurate results. More measurements mean longer acquisition times and, with them, more costs in terms of time and expense.

Our multi-channel ERT systems offer an unprecedented level of speed and quality, allowing you to get your data quickly and accurately. With our unique parallel measurement mode, you can measure up to 96 potentials simultaneously, giving you the ability to see exactly what your target looks like in two and three dimensions. In the X624EM version, the on-board screen allows you to monitor the relief in real time. In the ET300 version, this is possible using an external tablet or laptop.

The results are incredibly clear: no more hours of waiting for a single ERT profile; Now you can see them all at once, on one screen, in real time.



1 OVERVIEW

ET300



- ▶ Use with external PC
- ▶ 24bit ADC Converter
- ▶ 300 Watts
- ▶ Up to ± 800 V
- ▶ Up to 20 measurement channels
- ▶ Available with 24 and 48 electrodes

X624EM



- ▶ All-in-one
- ▶ Touch screen 10"
- ▶ 24bit ADC Converter
- ▶ 600 Watts
- ▶ Up to ± 800 V
- ▶ Up to 96 measurement channels
- ▶ Real-time 3D pseudosection
- ▶ 2D and 3D sequences directly on board

Generals

ET300

X624EM

ADC Technology	24bit Delta-Sigma ADC	24bit Delta-Sigma ADC
Number of electrodes	24-48	48-72-96
Channels	With 20 channels	Up to 96 channels
Array configurations	1D, 2D, 3D	1D, 2D, 3D e time-lapse
Measurements	Self-potential, resistivity, induced polarization	Self-potential, resistivity, induced polarization
Dimensions	40x33x17 cm	49x39x23
Weight	6.3kg	18kg
Display		10" touch screen
GPS		Yes
Export compatibility	RESinv, ERTlab, ZondRES, MAE	RESinv, ERTlab, ZondRES, MAE
Roll-along function	Software controlled	Software controlled
Real-time pseudosection	1D, 2D and 3D	1D, 2D and 3D
Sequence generator	1D, 2D and 3D	1D, 2D and 3D
Case	IP67	IP67
Enviromental condition	-20°C/90°C	-20°C/90°C
Power supply	External 12V battery, suggested 100Ah	External 12V battery, suggested 100Ah
Average consumption	0.5A, up to 50A peak	2.5A, up to 50A peak
Output		
Power output	300W	600W
Voltage output	±50, ±100, ±200, ±400, ±800	±50, ±100, ±200, ±400, ±800
Current output	up to 6A at 50V, up to 0.375A at 800V	up to 12A at 50V, up to 0.750A at 800V
Energization diagram	Custom from 250ms	Custom from 250ms
Precision	±0.2 µA	±0.2 µA
Accuracy	< 0.2 %	< 0.2 %

Input

ET300

X624EM

Measurements strategy

Parallel

Parallel

Input voltage

$\pm 25V$

$\pm 25V$

Precision

1.5 μV vs fullscale

1.5 μV vs fullscale

Accuracy

< 0.2 %

< 0.2 %

Input impedance

2.5M Ω

100M Ω

Stacking and noise reduction

up to 255

up to 255

Input notch filter

50Hz

50Hz

Self potential adjustment

Automatic

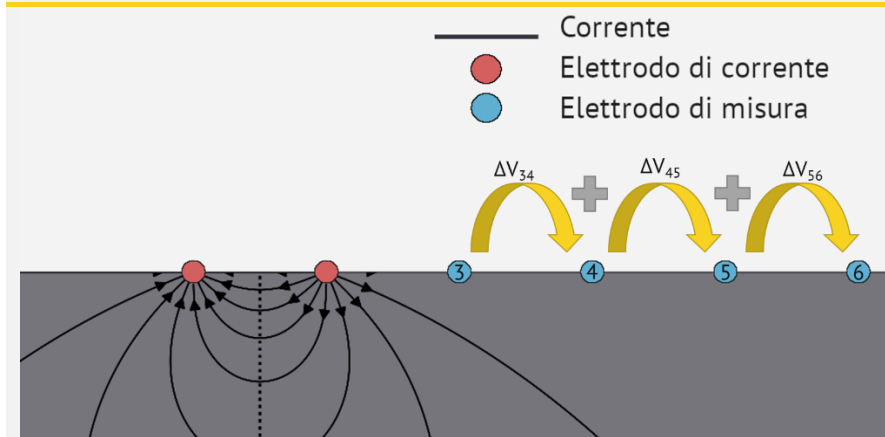
Automatic

IP's windows

Up to 20 windows at 20ms interval

100Hz sampling

Multichannel parallel strategy



With this strategy, the electrodes are directly connected to the differential channels and are measured simultaneously.

For example:

$\Delta V_{34} | \Delta V_{45} | \Delta V_{56}$.

In this configuration it is possible to obtain the measurement between non-adjacent electrodes simply by adding the potential differences of the adjacent electrodes.

$\Delta V_{36} = \Delta V_{34} + \Delta V_{45} + \Delta V_{56}$

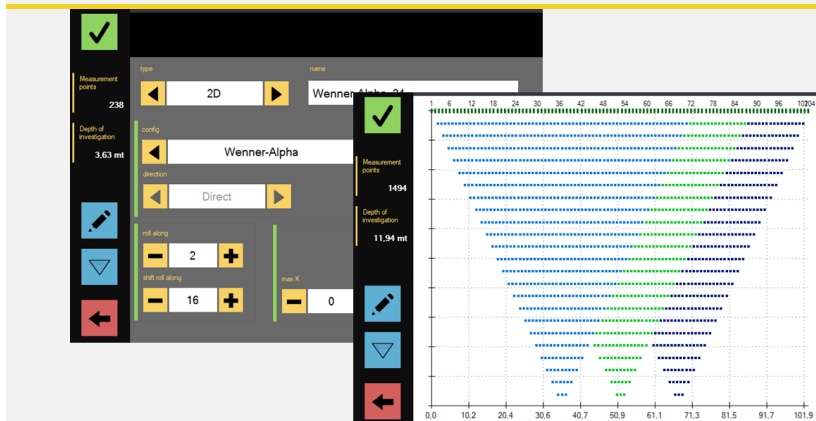
Our multi-channel strategy represents a turning point in the acquisition of electrical data. With our electric instruments, the measurement speed reaches unprecedented levels, especially when it comes to 3D configurations. This means you can get accurate and detailed results quickly, saving hours of fieldwork and reducing operating costs.

Survey time (hh:mm)	Measuring points	Mono channel	10 channels	Multichannel MAE
Wenner Schlumberger	6759	> 2:10	~ 1:45	< 01:20
Dipole-Dipole 3D	70312	> 11:00	~ 2:30	< 00:44
2D Polo-Pole	4371	> 1:20	~ 00:10	< 00:02

With our multi-channel strategy, we make sequence design more efficient and accurate. We eliminate the need to spend valuable time manually identifying quadrupoles or significant lines, as our technology takes care of this automatically. Thanks to parallel measurements, we obtain a huge amount of data without increasing acquisition times. In other words, we get more information without sacrificing measurement speed.

Our electric instruments are designed for maximum efficiency and ease of use, allowing you to unlock the full potential of geoelectric technology without unnecessary complications. With MAE, you'll get the perfect combination of speed, accuracy, and reliability, making your geoelectrical surveys a rewarding and successful experience.

Sequencer



The management software offers a wide range of options for measuring sequence design. You can configure the number of electrodes, spacing and 3D geometry, as well as preview the designed sequence.

The **Sequencer** offers a number of unique and powerful benefits that greatly simplify the geoelectric measurement design process. Here are three key strengths of this feature:

Versatility directly in the field and on board the instrument: Thanks to our innovative sequence design, you no longer have to spend valuable time designing configurations on an external device. Everything you need is available right in the field, making the setup process quick and hassle-free. You can easily adapt sequences to your specific survey needs without the need for external tools.

Immediate visualization of the expected configuration and estimate of the depth of investigation: The software gives you a real-time view of the configuration of the designed sequence, allowing you to immediately see how the measurement points are arranged and what the expected depth of investigation will be. This feature allows you to optimize the sequence to get the best possible results and ensure that each measurement is meaningful and useful for your geoelectric survey.

Save time and increase efficiency: Designing sequences directly on board the instrument saves you valuable time by eliminating the need to return to the lab for complex configurations. With the ability to preview sequences and make changes on-site, you can complete design tasks quickly and be ready to start measurements in a timely manner.

With our built-in Sequencer, we give you a powerful tool to simplify the process of configuring geoelectric measurements, improve efficiency in the field and achieve the desired results quickly and reliably. Our range of electrical tools is designed to meet the needs of geoelectrical professionals and provide cutting-edge solutions for your survey projects.

Methodology



It allows you to set parameters for the following methodologies:

- ▶ Spontaneous potentials
- ▶ Resistivity
- ▶ Induced polarization

You can select the input voltage, expected current, and input times.

Our software suite offers a wide range of measurement methodologies to choose from, allowing you to fully customize your geoelectrical data acquisition process. Here are three strengths of the Methodology feature:

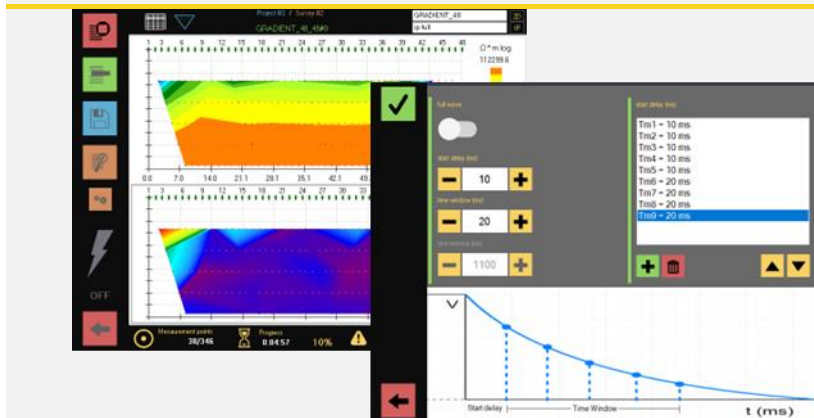
Flexibility in measurement methodologies: Thanks to our technology, you can select between different measurement methodologies, including spontaneous potentials, resistivity, and induced polarization. This flexibility allows you to tailor your survey to the specific terrain characteristics and survey objectives, ensuring that you can obtain the most relevant and meaningful data for your research.

Customization of measurement parameters: you have full control over the measurement parameters. You can set the number of iterations and quality parameter to optimize your measurements to meet your specific needs. In addition, you have the possibility to adjust the current and voltage and energization times to adapt your investigation to different soil conditions and obtain accurate and reliable results.

Increased accuracy and control: The ability to select measurement methodology and customize parameters gives you a greater degree of accuracy and control over your geoelectric survey. You can adapt the measurement process to the unique characteristics of the terrain and improve the quality of the data collected. This precision and control allow you to get more accurate results and make informed decisions based on reliable data.

With our methodology choice feature you can explore and experiment with different geoelectric measurement techniques, fully customizing your data acquisition process. This flexibility and control will help you achieve more meaningful results and maximize the value of your geoelectric surveys. We are here to support you every step of the way, providing cutting-edge solutions and high-quality tools for your success.

Windows Induced polarization



The software supports advanced features for induced polarization. You can define time windows with sample interval starting at 10ms. These advanced features allow you to achieve greater accuracy and control in IP measurements.

Our induced polarization capability offers unprecedented flexibility in selecting measurement windows, allowing you to tailor the data acquisition process to your specific needs. Here are some key points of this powerful feature:

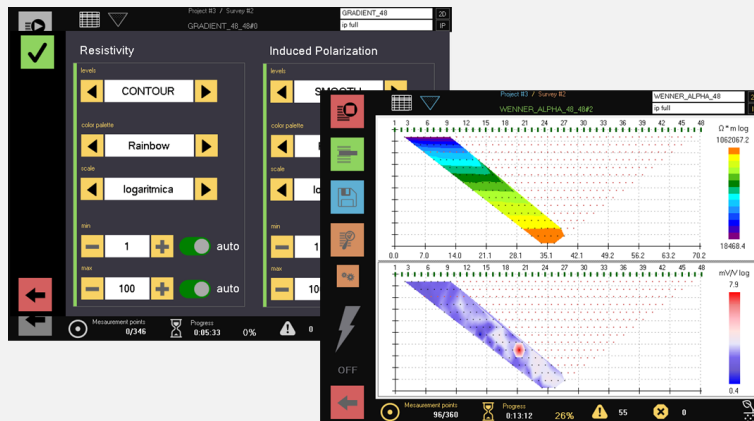
Custom measurement windows: You have complete control over the choice of measurement windows for induced polarization. You can select windows from 10ms of sampling, offering the ability to capture subtle, short-lived details in terrain responses. Flexibility in the choice of windows allows you to adapt the measurement process according to the complexity of the terrain and the objectives of the survey.

Wide range of options: Depending on the instrument model you are using; you have a wide range of options for measurement windows. With the ET300, you can choose up to 20 measurement windows, while the X624EM gives you unlimited windows. This wide choice gives you greater freedom of exploration and allows you to capture detailed and complete data for your analysis.

Full IP Functionality: Our full IP feature allows you to get the full discharge curve for induced polarization. This means you can get a complete representation of the terrain's response over time, capturing every detail and variation. This advanced feature gives you greater precision and depth in your analysis and helps you get more accurate and meaningful results.

Our induced polarization feature gives you the ability to make the most of the potential of this measurement technique, allowing you to tailor the data acquisition process to your specific needs and get detailed and reliable results. We pride ourselves on offering you high-quality tools and state-of-the-art solutions to meet your geoelectrical survey needs.

2D pseudosection



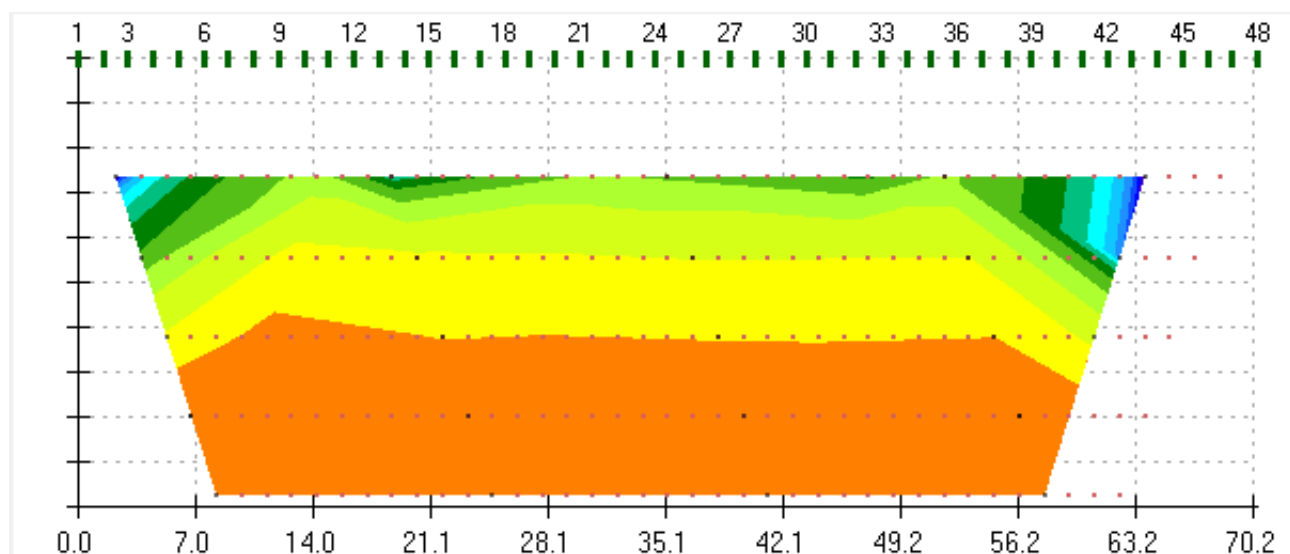
The software offers different modes of live visualization of the acquired data. It allows you to customize and display the 2D pseudosection for both resistivity and induced polarization. The simultaneous display of the pseudosections provides a clear and intuitive representation of the investigation.

Real-Time Visualization: The 2D Pseudosection offers the possibility to immediately visualize the data acquired during the measurement, allowing operators to have an instant view of the characteristics of the terrain in the investigated areas.

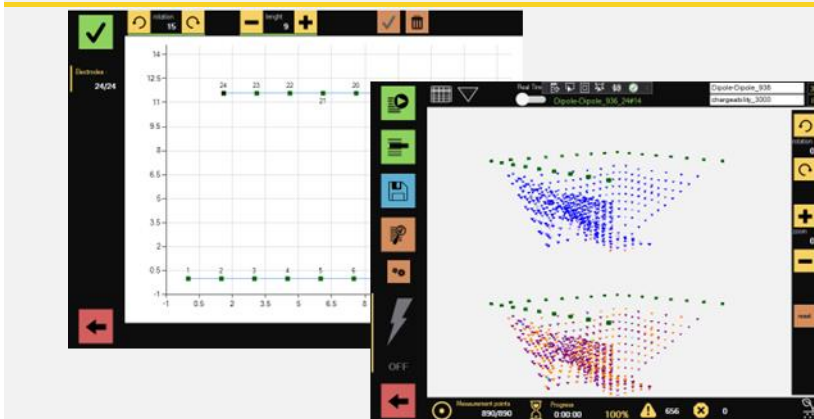
Detailed Information: By representing both resistivity and chargeability (IP) in a single pseudosection, users can obtain detailed information about the distribution of electrical properties of the soil. This helps to identify possible geological structures, anomalies, or other features of interest.

Parameter Customization: The 2D Pseudosection allows you to customize the appearance of the visualization, for example by choosing between different chart options (contour or smooth) to obtain the format that best suits the user's needs. In addition, you can adjust color scales and display extremes to highlight specific ranges of values.

Thanks to these features, the 2D Pseudosection offers an important resource for geophysical operators during geoelectric surveys, allowing them to perform detailed analysis and make informed decisions based on the acquired data.



3D pseudosection



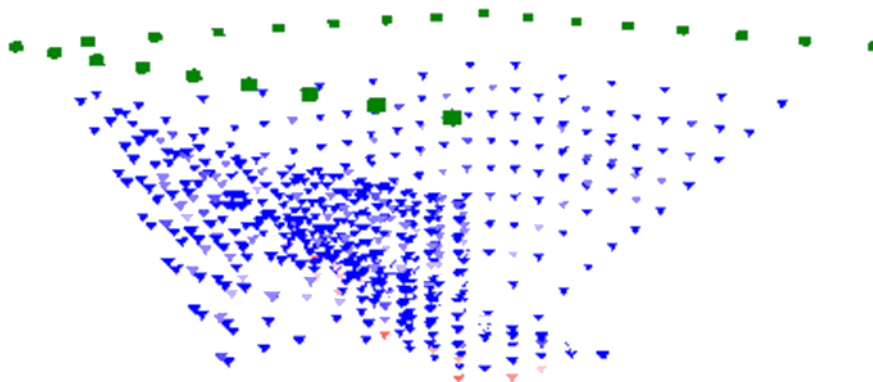
The 3D pseudosection functionality of the software allows intuitive and fast insertion of electrode geometry. You can easily define the position of the electrodes in the field of investigation and view a representation of the acquired data.

Three-dimensional visualization: The 3D Pseudosection offers an immersive, three-dimensional experience to visualize data acquired during geoelectric surveys. Operators can explore the data as a virtual representation of the subsurface, enabling deeper analysis of geological structures.

3D Geometry Customization: The 3D Pseudosection allows users to enter the electrode geometry used during measurement and to view three-dimensional measuring points directly in real time. This feature provides instant feedback on data acquisition, making it easy to evaluate measurement point positions.

Choice of Parameters: As in the 2D Pseudosection, also in the 3D version it is possible to customize the display parameters to adapt the graph to the specific needs of the user. This includes options for color scales, chart options (contour or smooth), and other settings to get a clear and detailed representation of your data.

With 3D Pseudosection, geophysical operators can gain a deeper understanding of subsurface structure, spot anomalies or other features of interest, and make informed decisions based on a three-dimensional representation of acquired data.



Quality control

idx	A	B	M	N	K	lab (mA)	SP (mV)	Vmn (mV)	Res (ohm m)	SD (%)	IP (mV/V)	SD (%)
337	17	16	23	24	1583	199.93	-6.42	-177.83	-1401.83	3.3	-	-
338	18	15	21	24	85	200.11	-42.75	-5.85	-4.11	552	-	-
339	18	16	20	22	57	198.58	-38.09	-2.21	-0.75	137	-	-
340	18	16	22	24	228	198.58	-37.47	-6.43	-7.82	527	-	-
341	18	17	19	20	28	197.43	-16.89	-4.64	-0.36	740	-	-
342	18	17	20	21	113	197.43	-24.93	3.71	3.28	316	-	-
343	18	17	21	22	283	197.43	-16.7	3.96	8.61	305	-	-
344	18	17	22	23	985	197.43	-21.86	-14.94	-24.45	150	-	-
345	18	17	23	24	999	197.43	-23.81	8.32	51.33	168	-	-
346	19	17	21	23	57	201.59	-42.75	8.05	1.31	784	-	-
347	19	18	20	21	28	203.67	-15.18	2.32	0.2	130	-	-
348	19	18	21	22	113	203.67	-22.33	-0.52	-0.72	137	-	-
349	19	18	22	23	283	203.67	-22.22	-8.01	-13.55	178	-	-
350	19	18	23	24	565	203.67	-15.59	2.78	5.51	831	-	-
351	20	18	22	24	57	200.08	-36.25	-4.15	0.43	235	-	-
352	20	19	21	22	28	199.79	16.54	7.92	1.26	205	-	-
353	20	19	22	23	113	199.79	15.1	-3.8	-1.59	666	-	-
354	20	19	23	24	283	199.79	18.68	-4.38	-0.85	556	-	-
355	21	20	22	23	28	199.42	-5.66	182.85	25.89	6.1	-	-
356	21	20	23	24	113	199.42	-7.78	178.3	99.97	2.6	-	-
357	22	21	23	24	28	201.07	-0.83	171.89	24.18	1.9	-	-

The software also includes a feature for measurement verification and low-quality data management. Two indicators highlight low-quality data or any measures not taken. In addition, the software allows quick correction of problematic data.

Standard Deviation: The instrumentation offers the possibility to calculate the standard deviation for both the measurement of Induced Polarization (IP) and for resistivity. This measure of statistical dispersion allows operators to assess the consistency and reliability of the data collected.

Quality Control: You can set a desired quality threshold for standard deviation. In this way, operators can focus only on measurements with standard deviation values that are within pre-established quality limits, eliminating measurements with excessive deviation values.

Warning for Problematic Measures: The attention function automatically alerts you to measurements that have had problems, such as measurements not performed correctly, or currents read too low. This alert allows operators to quickly identify potentially incorrect or unreliable measurements, allowing them to intervene promptly and correct any anomalies.

The measurement verification and warning function guarantee a high level of control over the quality of the data acquired, allowing operators to obtain accurate and reliable results during geoelectric surveys. This capability is critical to ensuring the effectiveness of geophysical studies and making informed decisions based on high-quality data.

idx	A	B	M	N	K	lab (mA)	SP (mV)	Vmn (mV)	Res (ohm m)	SD (%)	IP (mV/V)	SD (%)
1	1	12	2	3	18.4398	-	-	-	-	-	-	-
2	1	12	3	4	52.1988	-	-	-	-	-	-	-
3	1	12	4	5	93.1390	-	-	-	-	-	-	-
17	12	23	19	20	93.1390	-	-	-	-	-	-	-
18	12	23	20	21	52.1988	-	-	-	-	-	-	-
19	12	23	21	22	18.4398	-	-	-	-	-	-	-
20	23	34	24	25	18.4398	-	-	-	-	-	-	-
21	23	34	25	26	52.1988	-	-	-	-	-	-	-

Remote control

With the remote-control feature of MAE tools, you can get complete control from anywhere and at any time. This allows you to maximize the efficiency of your operations, saving valuable time and responding quickly to the needs of your projects.

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Tablet/smartphone control: using the on-board CPU, you can easily manage your instruments directly from your smartphone or tablet. Change settings, start captures or monitor device status wherever you are, giving you unprecedented flexibility.

Home monitoring: You have the ability to follow the progress of your investigations directly from the comfort of your home or office. Design surveys from home, initiate acquisitions, and track progress without leaving your workplace.

Data on MAE service in the cloud: your data is among the most valuable assets of your work. Thanks to the MAE service, you can easily archive and retrieve your data. This secure platform gives you instant access to your data wherever you are, simplifying project management.

With MAE remote control, you have the power to take your geoelectric surveys to a new level of efficiency and control, ensuring the success of your projects with maximum convenience!