

xTEM product description and detailed specifications

Table of Contents

1.	Introduction to xTEM	1
	Experts to help	2
2.	Main differences between xTEM and sTEM ...	3
3.	The instrument	3
	Extended support	5
	App premium functionality	5
4.	External processing software	5
5.	Document change log	6
6.	Detailed specifications	6
	Definitions and abbreviations	6
	Transmitter specifications	6
	Internal receiver characteristics	6
	Wireless Receiver Characteristics	6
	Transmitter Coil	7
	Receiver Coil	7
	Battery charging suitcase	7
	Weight and dimensions for a standard system	7



1. Introduction to xTEM

The xTEM system delivers efficient, reliable data for deep imaging of mineral deposits and other

geological structures in 2 or 3 dimensions. It conducts measurements from a single powerful transmitter source using wireless, independent, lightweight receivers. Since GPS-synchronized receivers can be deployed simultaneously, surveys with hundreds of receiver stations in 3D can be performed quickly, once the transmitter coil is set up. Depth of investigation is 500 m to as much as 1000 m, depending on geology, stacking time, choice of transmitter coil size, and receiver coils.

Depth of investigation is not just about how much power the transmitter can output and the size of the transmitter coil. It is also about how much the noise level in the receiver system can be lowered. Increasing the power of the transmitter by a factor of 2 has the same effect on the data as lowering the noise level by the same factor. It means that the 30 Amp (60 Amp P-P) xTEM transmitter performs as well as a 60 Amp or even a 120 Amp transmitter, because the receiver system, with its combination of high-performing coils and intelligent noise suppression, yields a factor of 2 to 4 lower noise level.

The xTEM system shown in Figure 1, is lightweight and intuitive to use. Setting up the system is easy, and what normally takes most of the time is laying out the large transmitter coil. The receiver coils for measuring the z-component can either be mounted on easy-to-carry fixed rig coils with side lengths of 1,65 or 3 m, or be 5 x 5 m loose coils for the lowest possible noise level. X-component data is measured using the 1.65 m rig. Measured data are displayed in the app in real time and synchronized with transmitter data once the survey is done.

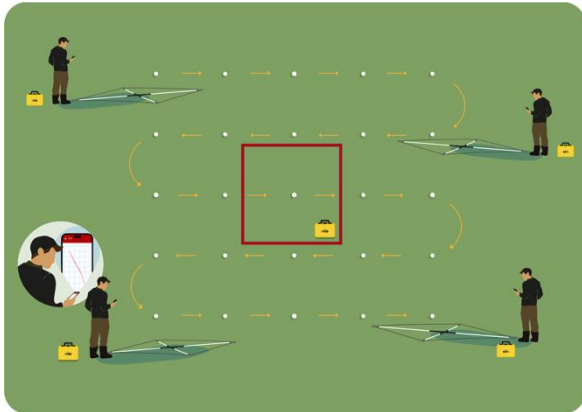


Figure 1. The sketch shows the xTEM system. The transmitter is stationary with a size of up to 200 x 200 m. Several receivers can be operated at the same time, measuring multiple stations at the same time.

Typical applications for xTEM are mapping of mineral targets or geological structures in 2D or 3D. Surveys can be done with full coverage both inside and outside of the coil, as shown in Figure 1, but it can also be done along a transect typically going through the center of the coil and stretching 4 – 6 times the coil side length to each side. This is illustrated in Figure 2. Other targets are very deep aquifers where a typical setup would be one station in the center and 4 stations in a star shape, 4 – 6 times the coil side length away from the center. This setup is illustrated in Figure 3. The xTEM transmitter and receiver boxes themselves are shown in Figure 4.

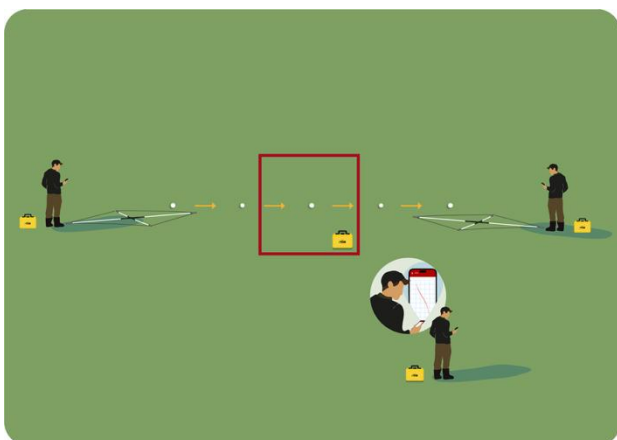


Figure 2. The sketch shows the xTEM system being used to measure long transects across a single transmitter coil.

Experts to help

At TEMcompany, we are committed to providing comprehensive support to our customers. We engage in close dialogue to assist with survey planning, help with data quality control, and even aid in interpreting results. Our team of experts is always available to offer guidance and expertise, ensuring that the xTEM instrument provides maximum value.

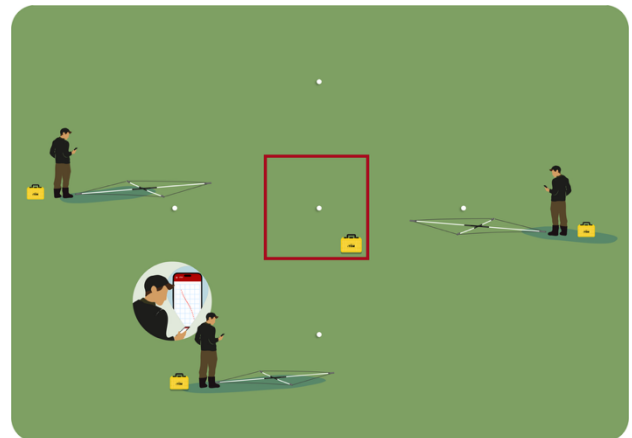


Figure 3. The sketch shows the xTEM system being used for deep groundwater exploration. The stations are placed in a star shape around the transmitter coil.



Figure 4. The xTEM instrument boxes, in picture: receiver unit on the left, transmitter unit to the right.

2. Main differences between xTEM and sTEM

While the xTEM and sTEM instruments share numerous similarities, they also exhibit several distinct differences. They can best be summarized as:

1. **Depth of investigation:** The xTEM system is designed to give maximum depth of investigation of up to 1000 m depending on geology. sTEM covers a typical depth of investigation from the surface to 600 m.
2. **Mobility:** The xTEM is designed for surveys with one large transmitter coil and many receiver stations being made inside and outside the transmitter. The sTEM is designed for small coils with one receiver station, typically in the center of the coil or with small offsets, like for the sTEMprofiler rig.
3. **Time to transmit and measure:** The xTEM transmitter can be running for hours while all the receiver stations are being measured. The sTEM typically runs for 30 seconds up to 10 minutes, while a single receiver station is measured.
4. **Power:** The xTEM transmits 20 – 30 Amps (60 Amp P-P) for hours and is therefore water-cooled. The sTEM transmits 5, 10, or 20 Amps and is either passive cooled or cooled with a fan (the 20 Amp version). Under extreme hot conditions, the sTEM might not be able to measure for more than 10 -15 minutes at a time due to overheating.
5. **Weight:** The xTEM is powered by 3 bulky lithium batteries, adding weight to the setup. The transmitter itself is only about 8 kilograms. The sTEM uses small and lightweight lithium batteries, which are integrated into the receiver unit and are hence easy to move around.
6. **Transmitter coils:** The xTEM uses large coils with thick wires. The 200 x 200 m coil is made of thick 10 mm² cable on 8 drums. The sTEM uses lightweight and easy-to-carry and move transmitter coils.
7. **Data inversion:** TEMcompany does not provide specialized data inversion software for xTEM data for mineral exploration, however, TEMImage can be used for groundwater exploration. Typical mineral exploration data will be loaded into programs like Maxwell or plotted as normalized voltages. For sTEM, TEMcompany provides full inversion packages based on one-dimensional algorithms.

3. The instrument

The xTEM instrument is a modular system specifically designed for efficient 2D and 3D mapping, along with very deep investigations. The modularity for multiple receiver units to be operated independently at the same time.

The xTEM transmitter is battery-powered, lightweight, and very easy to operate in the field. Alternating between a low and a high moment ensures both shallow and deep resolution. In the 80 x 80 m coil, the output current is a steady 30 Amp (60 Amp P-P), while in the 200 x 200 m coil, the current is 20 Amp.

The xTEM receivers only weigh eight kilos and are designed with very low-noise electronics, smart signal processing, and tapered gating. Combined with the carefully designed receiver coils, where the bandwidth is chosen so it fits with the transmitter ramp-off, gives a large depth of investigation. Multiple receivers can be used at the same time, significantly speeding up data acquisition time for larger surveys

Data is measured station by station, with both the receiver and transmitter units controlled from the TEMcompany iOS/Android app. The app supports maps, allowing users to load background images and survey planning maps. It automatically measures and saves the high-precision GPS positions of receiver stations. For even greater precision, users must add an external high-precision GPS of their choice.

Key parameters for the xTEM system are shown in Table 1.

Property	Value
Depth of investigation	500 – 1000 m
Nominal sounding distance	50 m
Operation mode: Dual Moment	Low moment: 1 Amp High moment: max 30 Amp (60 Amp P-P)
First gate center time	Low moment: ~15 us High moment: ~30 us
Last gate center time	Low moment: 500 us High moment: > 100 ms
Receiver components	Up to 2 for simultaneous measurement of z- and x-components.
Batteries	Receiver: 1 Li-Ion 14.4 V Transmitter: 1 Li-Ion 14.4 V 3 Car or Li-Ion 12 V
Time of continuous operation	More than 10 hrs
Weight of instruments, excl. batteries and carrier system	Receiver: Less than 8 kg Transmitter: 8 kg

Table 1 The table shows key specifications for the xTEM transmitter and receivers.

xTEM has two choices of transmitter coils. Key parameters including transmitter moment for these coils are shown in Table 3 The table Table 2

Property	80 x 80 m	200 x 200 m
Area	6,400 m ²	40,000 m ²
Magnetic moment	192 kAmp m ² (30 Amp)	800 kAmp m ² (20 Amp)
Total wire length	320 m	800 m
Number of drums	4	8
Weight incl. drum	7.0 kg / drum 6 mm ²	12.0 kg / drum 10 mm ²

Table 2 The table shows the key specification for the xTEM transmitter coils

An xTEM receiver can be equipped with one or two receiver channels for simultaneous measurement of the x- and z-components. While several options

exist for the z-component receiver coil, the x-component is always measured with a 1.65 x 1.65 m coil mounted on a fixed rig. The options are shown in Table 3 and Figure 5 illustrates how the 1.6 m rig is used to measure the x-component.

Property	1.6 m	3 m	5 m
Area * turns	20,5 m ²	72 m ²	200 m ²
Number of turns	8	8	8
With fixed rig	Yes	No	No
Used for component	x and z	z	z
Bandwidth	250 kHz	200 kHz	150 kHz
Signal/Noise ratio	Good	Better	Best

Table 3 The table displays the options and properties of the various receiver coils that can be used with xTEM.

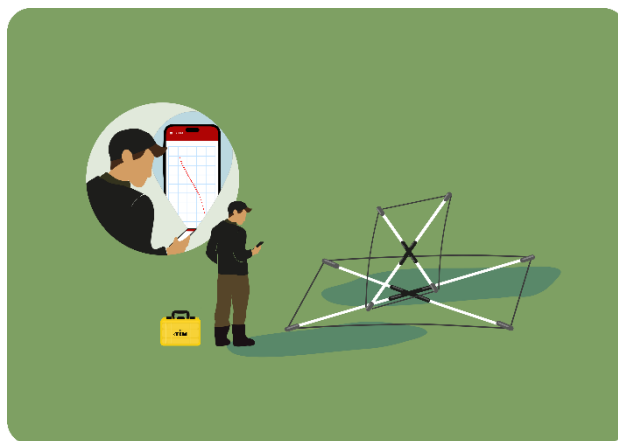


Figure 5 The figure illustrates how the 1.6m rig is used to measure the x-component by setting it vertical. The z component is measured simultaneously by the coil lying on the ground.

The app makes the operation of the instrument intuitive and does not require special skills from the operator. The app comes preloaded with measurement scripts for either 50 or 60 Hz powerline operation. The app monitors key parameters such as output current, temperature of the electronics, power level of the battery etc. It also displays the raw stacked transients.

Data is organized in a project, and a project can have several lines. A new line is initiated with a simple tab on the screen.

The app has map functionality, data is displayed as it is measured and with Premium functionality, data

is also inverted and displayed in a section view. This is illustrated in Figure 6.



Figure 6 The figure shows the iOS/Android app with a single model and a cross-section. This functionality is enabled with a Premium license.

Extended support

Access to extended support is offered on a yearly subscription basis by the expert Customer Support team at TEMcompany. The team offers support for survey design and data quality assessment.

Many customers sign up for extended support in the first year, as they familiarize themselves with the instrument. After the first year, they typically manage on their own.

App premium functionality

The xTEM instrument is designed under the TEMcompany philosophy of being able to receive future upgrades and to be customizable in various ways. It always comes with a software package providing basic functionality and the ability to export data to a Windows PC for processing.

Premium functionality is offered on a yearly subscription basis. With the subscription, several features are unlocked in the iOS/Android app.

The premium functionalities are:

- The DOI is calculated together with the quality of the data fit. These parameters are shown in the cross-section.
- The accumulated station stack size for every 10 seconds shown in the app.

- The individual transients are gated using non-square gates, also known as tapered gates. Tapered gates increase the signal-to-noise ratio by up to a factor of 2.
- Several other features in the app are unlocked. These include notes and pictures of the site.
- A free viewer for displaying the measured data on maps is supplied. This viewer software runs on Windows operating system.

4. External processing software

Data collected by xTEM can be processed and inverted in 2D and 3D or using a thin sheet approximation. If used for deep groundwater or quasi-layered environments, data can also be inverted in 1D. TEMcompany supports an open-data format with documentation to ease the process of processing and inverting the data.

5. Document change log

Data	Change
20250902	Document created
20251103	P-P current added

6. Detailed specifications

The following is a list of all technical specifications for the xTEM system.

Definitions and abbreviations

LM	Transmitter low output current
HM	Transmitter high output current
Tx	Transmitter
Rx	Receiver
L, W, H	Length, Width and Height

Amp	Ampere
Amph	Ampere hours
V	Volt
Wh	Watt hours
°C	Degree Celsius
m	Meter
cm	Centimeter (10^{-2} m)
mm	Milli meter (10^{-3} m)
kg	Kilogram
hrs	Hours
Hz	Hertz
MHz	Mega Hertz (10^6 Hertz)
ms	Milliseconds (10^{-3} seconds)
Ohm	Resistance
P-P	Peak to Peak
us	Microseconds (10^{-6} seconds)

Transmitter specifications

Item	Value
Dual moment	Yes
Low moment current	3 Amp
High moment current	30 Amp (60 Amp P-P)
Number of Rx channels	1
Real-time inversion	Not relevant
Power Rx 14.4 V (99.5Wh)	1 battery
Power Tx 12 V (25 or 50 Amph)	Up to 3 batteries
Tx coil options	40x40 m, 80x80 m, 200x200 m or per request

Internal damping resistor	Nominal 330 Ohm
Waveform recording	Pre recorded
Control app	iOS, Android
Pulse on / off times	Pre-defined
LM On-time/Off-time	46%/54%
HM On-time/Off-time	30%/70%
Cooling	Water cooled with fan
Service and upgrades	Via Internet
IP rating	ABS, IP65
Dimensions	36 x 27 x 30 cm
Weight	6.1 kg
Operating temperature	-20 °C to +50 °C

Internal receiver characteristics

Item	Value
Sample rate	4 MHz
Dynamic range	>24 bit
Onboard computer	Intel/ASUS NUC12 or similar
Internal RAM	8 GB or more
Harddisk capacity	SSD, 256 GB or more
Operating system	Windows or Linux
I/O interface	Wi-Fi
GPS receiver	Built-in GPS with SBAS
Service and upgrades	Via internet
Bandwidth	~1 MHz
Max number of gates	1024
Tapered gating	Yes
Accumulated station stack	Yes

Wireless Receiver Characteristics

Item	Value
Sample rate	4 MHz
Dynamic range	>24 bit
Onboard computer	Intel/ASUS NUC12 or newer
Internal RAM	8 GB or more
Harddisk capacity	SSD, 256 GB or more
Operating system	Windows or Linux
I/O interface	Wi-Fi
GPS receiver	Built-in GPS with SBAS
Service and upgrades	Via internet
Bandwidth	~ 1 MHz
Max number of gates	1024
Tapered gating	Yes
Number of receiver channels	1 or 2
Accumulated station stack	Yes

IP rating	ABS, IP65
Power 14 V (99.5Wh))	1 x14 V
Dimensions	36 x 27 x 14 cm
Weight	4 kg
Operating temperature	-20 °C to +50 °C

Transmitter Coil

Tx Coil	40x40 m	80x80 m	200x200m
Number of drums	1	4	8
Effective area	1600 m ²	6400 m ²	40,000 m ²
Wire thickness	4 mm ²	6 mm ²	10 mm ²
Weight per drum	8.8 kg	6.0 kg	12 kg

Receiver Coil

Receiver coil	RCx10	RCx36	RCx200
Dimensions	1.6x1.6 m	3.0x3.0 m	5.0x5.0 m
Number of turns	8	8	8
Effective area	10,2 m ²	72 m ²	200 m ²
Bandwidth	~250 kHz	~200 kHz	~150 kHz
Carrier rig	Fixed rig	Soft coil	Soft coil
Weight	5 kg	6 kg	8 kg
Recommended for Tx coil	40x40, 80x80	80x80, 200x200	80x80, 200x200

Battery charging suitcase

Text	Rx battery	Tx battery
Charging capacity	14.4 V battery	12 V battery
Time to charge	2-3 hours	2h, depending on Amph
Weight	~0.5 kg	>5 kg

Weight and dimensions for a standard system

System	Total transport weight	Dimensions Length, width, height
TBD	TBD	TBD