TEMcompany

sTEMprofiler Instrument

Description and technical specifications

12-07-2024

TEMcompany
Value groundwater assets

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1. INTRODUCTION

The Profiler for the sTEM instrument maps subsurface geological layers, it produces close to continuous data, making it ideal for the location of new groundwater wells and estimating the extent of aquifer layers and groundwater recharge conditions.

The system is designed to be easy to use, and very little training is necessary for the field crew. The Profiler is operated from an iOS or Android App, and data is processed on a Windows PC.

Data is measured in 15 – 30 seconds. When done measuring, the rigs are lifted up, moved 10 – 20 m, and the process is repeated.

The standard Profiler has a maximum depth of investigation of around 150 m, while the Profiler+ has 4 times the signal-to-noise ratio, and hence it can go to a depth of around 200 m.

Depending on the instrument, a current of either 5 Amp, 10/12 Amp or 20 Amp is transmitted, and both configurations are powered by small, lightweight batteries.

The Profiler system is designed to be lightweight and portable. The instrument, transmitter, and receiver rig weigh only around 20 kg.



Figure 1: The Profiler in operation. The system is operated from an Android or IOS app. The transmitter and receiver rigs are engineered to be very stiff.

2. sTEMPROFILER

The Profiler is a very lightweight and mobile configuration used for rapid measurements with shallow to intermediate investigation depth. The sTEMprofiler is fully compatible with the sTEM5, sTEM10/12, and sTEM20 units; the Profiler compact is only compatible with sTEM10/12 and the sTEM20. The measurement configuration is illustrated in Figure 3. The coils are carried in a rigid, lightweight rig.

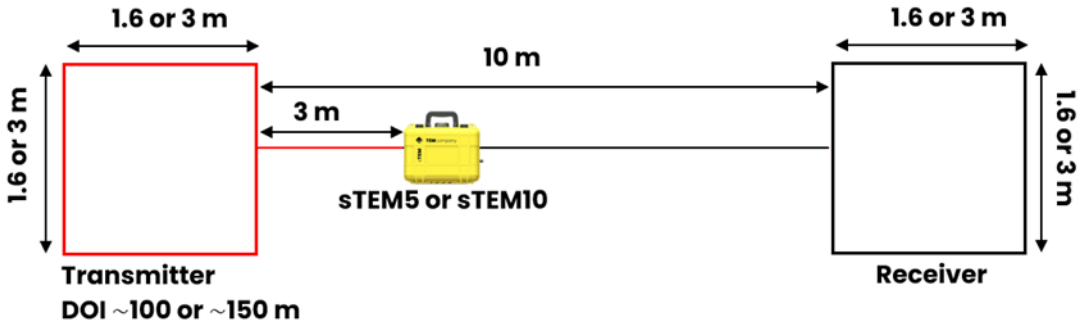


Figure 2: Profiler system, with the instrument located between the receiver and transmitter coils. The sTEM instrument is placed 3 m from the transmitter and 7 m from the receiver to avoid biased or noisy data interference.

Table 2 shows the properties of the receiver and transmitter coils.

Property	Profiler	Profiler+	Profiler compact
Transmitter size	3 m x 3 m, 2 turns	3 m x 3 m, 4 turns	1.6 m x 1.6 m, 2 turns
Transmitter area	18 m^2	36 m^2	5.12m^2
Receiver size	3 m x 3 m, 4 turns	3 m x 3 m, 8 turns	1.6 x 1.6 m, 4 turns
Receiver area	36 m^2	72 m^2	10.24 m^2
Separation between receiver and transmitter	10 m	10 m	10 m
Rig type	Rigid carrier rig for transmitter and receiver coils		
Weight of carrier rigs and coils	15.5 kg	16.0 kg	10.5 kg
Measurement time pr station	15 - 30 sec		
Profiling speed	10 m – 30 m between stations, 5-15 km/day		
Depth of investigation	Up to 150 m	Up to 200 m	Up to 100 m

Table 1: The table outlines the sTEMprofiler and compact key parameters.

3. sTEM INSTRUMENT

Several factors determine the depth of investigation, including the area of the transmitter loop, the area of the receiver loop, the stacking time, and the transmitter current.

The sTEM transmitter delivers two different maximum currents, as shown in Table 3. The instrument can be upgraded from 5 Amp to 10/12 Amp with a firmware upgrade.

Property	sTEM5	sTEM10/12	sTEM20
Peak output current	5 Amp	10/12 Amp	20 Amp
Measurement period time	~1.6 ms	~ 4.2 ms	~ 4.2 ms
Latest center gate time	~0.9 ms	~2.5 ms	~2.5 ms
Batteries 14.4 V, Li-Ion	2	2	3
Continuing operation time	~3 hr	~1.5 hr	~1.0 hr
Stations with 30 sec measurement time	~400	~200	~120
Weight, incl. batteries	6.1 kg	6.1 kg	6.5 kg

Table 3: The table shows specs for the three different sTEM instruments used with the sTEMprofiler system. The maximum current is transmitted in a loop with a maximum impedance of approximately 0.7 ohm.



Figure 3: The picture shows the sTEMprofiler system. The yellow box is the sTEM instrument, the white rods are used to build the rig and the cables to the left is the receiver and transmitter coils.

3.1 sTEM Controller app

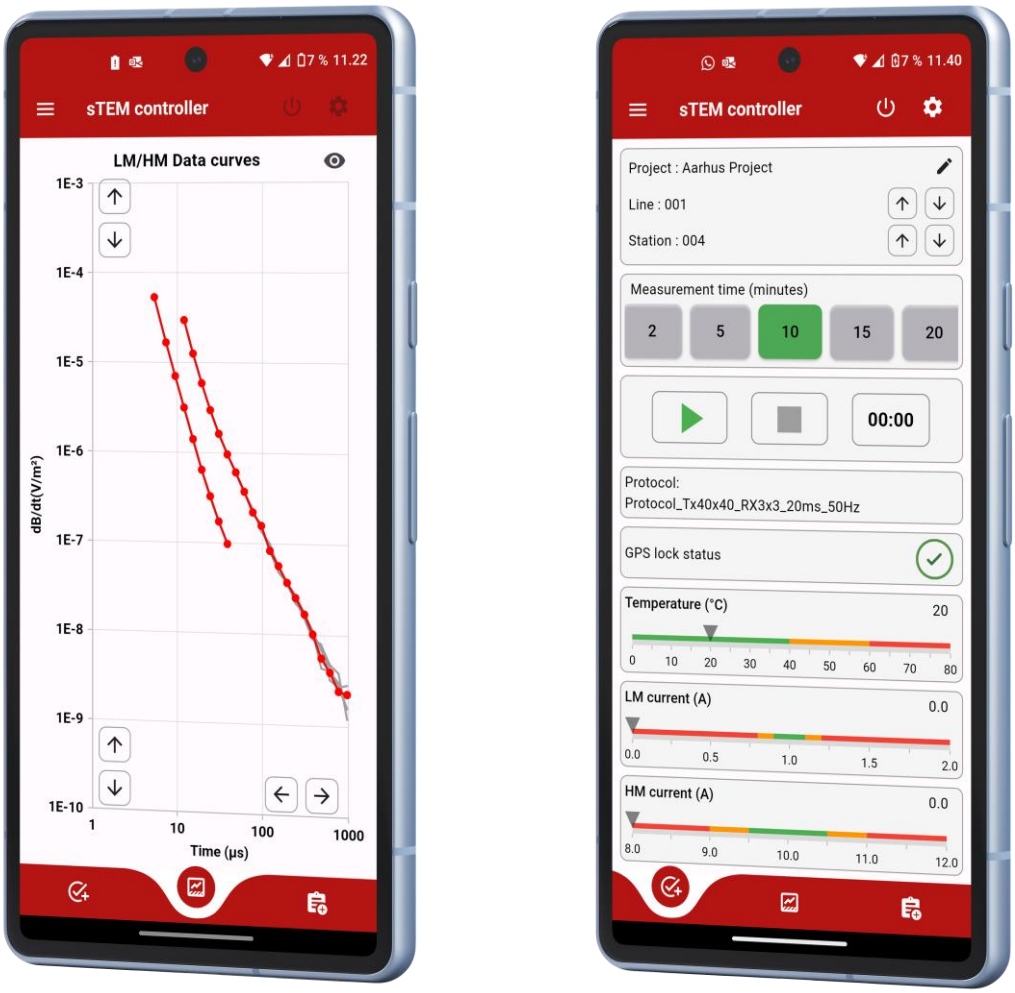


Figure 4 The picture shows the sTEM Controller app. The display to the left shows the measured decay curves, the display on the right show temperature, current and measurement time.

4. EXTENDED SUPPORT AND INSTRUMENT UPDATES

4.1 Extended support

Access to extended support is possible. With extended support, the team offers almost unlimited support for survey design, data quality assessment, data processing, and other functions.

The extended support is based on a subscription that is renewed annually. Many customers sign up for extended support for the first year and then master the measurements and the system themselves.

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 sTEMprofiler provides maximum value.

4.2 sTEM extended functionality and realtime inversion

The sTEMprofiler is designed for future upgrades and can be customized in various ways. It always has a software package that allows basic measurements and data to be exported to a Windows PC for processing.

Extended functionality is offered on a yearly subscription basis. With the subscription, several excellent features are unlocked.

These are:

- Data is inverted in real-time, and resistivity models of the subsurface are displayed every 10 – 20 sec. while measuring. This feature enables the system to cut measurement time short if target depth is reached faster than expected, or it can extent measurement time, to try and reach target depth in unfavorable conditions, in addition the data processing is most often done in real-time, and models are ready to be displayed in cross-section or on maps when the day is over.
- The accumulated station stack size is displayed, not only the individual 1 – 3 sec stacks. The accumulated stack shows the data and the data uncertainties after real-time processing.
- The individual transients are gated using non-square gates, also known as tapered gates. Using tapered gates increases the signal-to-noise ratio by up to a factor of 2. In perspective, this is the same as running, for example, the sTEM20 and 40 Amp instead of 20 Amp.
- Several features in the app, Figure 4, are unlocked. These include notes, pictures of the site, and the re-location of the GPS's position from the corner of the transmitter loop to the center.

5. TEMIMAGE – PROCESSING SOFTWARE

The data collected by the sTEMprofiler is voltage decay curves, which can be processed and inverted to resistivity models. The sTEMprofiler outputs a generic data format, which can be imported into the TEMimage.

TEMimage, Figure 5, the collected data can be viewed, processed, and inverted. Poor-quality data can be turned off, error bars edited, and prior information added to the starting model. The robust and fast TEMimage inversion code is used for the inversion.

The software allows advanced options and automatic few layers, smooth layers, and sharp layer inversion types.

TEMimage is offered as a perpetual program with an option of yearly subscription for updates.

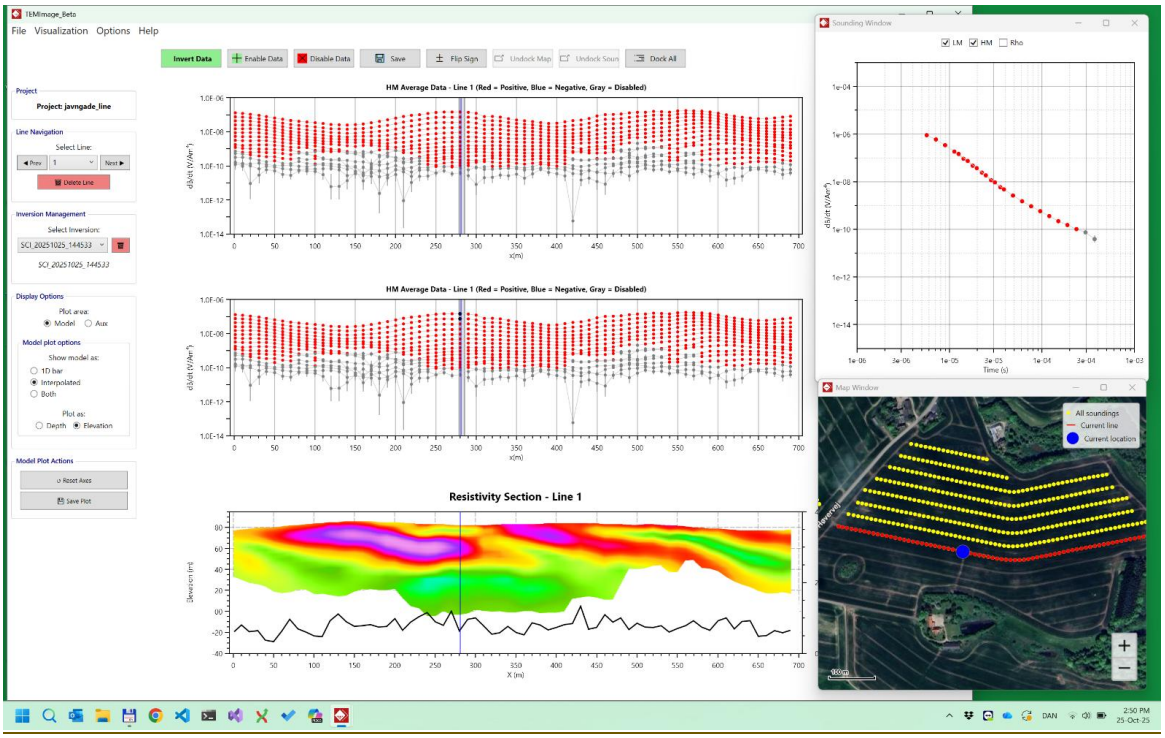


Figure 5 TEMimage processing screen.

6. DOCUMENT CHANGE LOG

25.03.2025

Detailed specifications have been merged into this document.

16.11.2025 esben Auken

Added description of the Profiler+ and sTEM10/12 instrument.

13-05-2026 Lis Gammelgaard

Added TEMimage

13-07-2026 Teodora:

Added: updated profiler+ receiver and transmitter area.

7. TECHNICAL SPECIFICATIONS

Definitions

LM Transmitter low output current

HM Transmitter high output current

Tx Transmitter

Rx Receiver

Transmitter Characteristics

	sTEM5	sTEM10/12	sTEM20
Dual moment	Yes	Yes	Yes
Low moment current	1 Amp	1 Amp	1 Amp
High moment current	5 Amp	10/12 Amp	20 Amp
Number of Rx channels	1		
Real-time inversion	Yes		
Power L (14.4 V, 6.8 Ah, 99.4 Wh)	2 batteries	2 batteries	3 batteries
Tx loop options	Only 3x3 m	3x3 m & 1.6x1.6 m	3x3 m & 1.6x1.6 m
Waveform recording	Pre recorded		
Control app	iOS, Android		
Pulse on / off times	Pre-defined		
Service and upgrades	Via Internet		

Receiver Characteristics

Text	Value
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	WiFi
GPS receiver	Built-in GPS with SBAS
Service and upgrades	Via internet

Bandwidth	App. 1 MHz
Max number of gates	1024
Tapered gating	Yes
Accumulated station stack	Yes

sTEM unit physical specifications

Text	Value
IP rating	ABS, IP67
Dimensions	36 x 27 x 14 cm
Weight	6.1 kg (sTEM20 6.6kg)
Operating temperature	-20 ˚C to +50 ˚C

Transmitter Coil

Tx Coil	Profiler compact	Profiler	Profiler+
Dimensions	1.6x1.6 m	3.0x3.0 m	3.0x3.0 m
Number of turns	2	2	4
Effective area	5.12 m^2	18 m^2	36 m^2

Receiver Coil

Receiver coil	Profiler compact	Profiler	Profiler+
Dimensions	1.6x1.6 m	3.0x3.0 m	3.0x3.0 m
Number of turns	4	4	8
Eeffective area	10.24 m^2	36 m^2	72 m^2

Battery charging suitcase

Text	Value
Charging capacity	6900 mAh
Time to charge battery	2-3 hours

Weight and dimensions for a standard system

System	Total transport weight	Dimensions Length, width, height
sTEM, 3x3 m, receiver coil, leadin, battery charging suitcase, two batteries, transport case	~42 kg	80 cm x 60 cm x 45 cm and 120 cm x 40 x 20

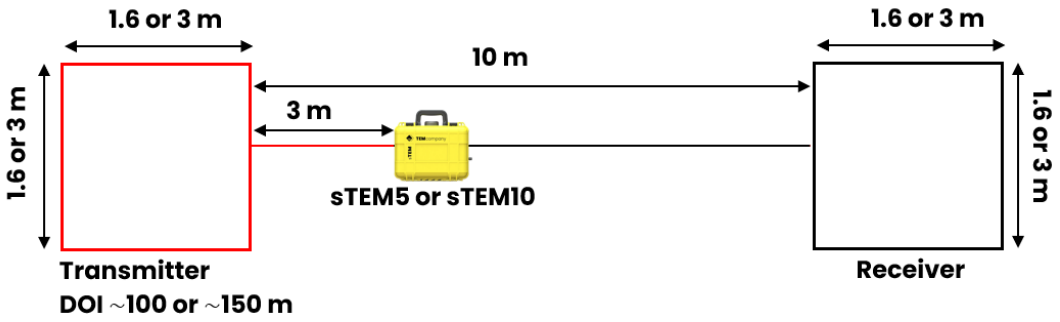


Figure 6: Sketch of the offset loop sTEMprofiler coil configuration, sTEM5 is only compatible with 3x3 m transmitter.

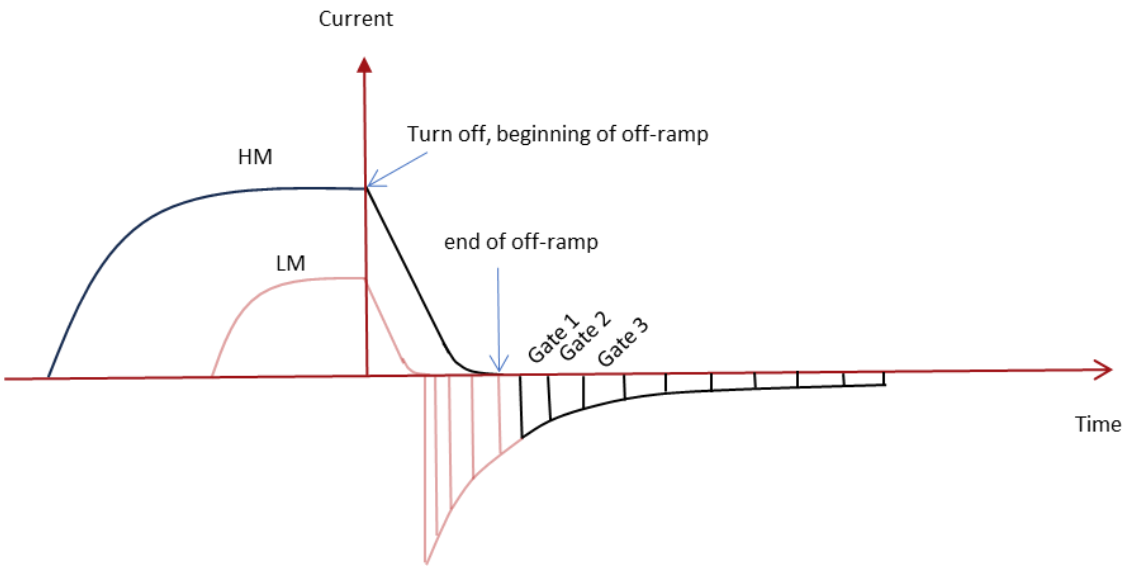


Figure 7: Idealized visualization of the waveform, turn-off ramp and gates. Not to scale.