

KT-10 and KT-20 Frequently Asked Questions (FAQ)

1. *What's the difference between the KT-10 and KT-20?*

The **KT-10** is a handheld magnetic susceptibility and conductivity meter, which can be used to solely measure magnetic susceptibility or conductivity, or to measure both simultaneously. The KT-10 has a 10 kHz operating frequency and comes with a fixed sensor available in either a circular or rectangular design.

The **KT-20** is a modular physical property measuring system with interchangeable sensors, which can be used to solely measure magnetic susceptibility or conductivity, to measure both simultaneously, and to measure IP/resistivity and density. A variety of interchangeable sensors are available in different shapes (circular, rectangular, and curved) and frequencies (1 kHz, 10 kHz, and 100 kHz) to facilitate a wide range of applications.

2. *What are the benefits of using different shaped sensors?*

The KT-10 and KT-20 have different sensor shapes, as shown below, to adapt the instruments to measure a variety of samples. Choosing the ideal sensor shape will ensure a better measurement.

Sensor Shapes	KT-10	KT-20
Circular	✓	✓
Rectangular	✓	✓
Curved	✗	✓

Circular sensors have a diameter of 65mm for the KT-10 and 66 mm for the KT-20 and are ideal for measuring large, flat samples. They feature a pin mode for measuring samples with uneven surfaces, such as outcrop or mine walls. The pin mode is included with all circular design KT-10 models and the 10 kHz Single-Frequency Circular Sensor for the KT-20.

Rectangular sensors have dimensions of 65mm x 32mm for the KT-10 and 65mm x 38mm for the KT-20. This narrower design is ideal for measuring small, flat samples or split drill core.

Curved sensors are for measuring full cylindrical core samples. There are 10 kHz and 100 kHz curved sensors available in dedicated BQ, NQ, HQ, or PQ diameters. Their curved shape allows users to achieve a higher sensitivity for magnetic susceptibility or conductivity, while producing consistent, repeatable measurements.

3. What are the benefits of using different frequencies?

Below are the operating frequencies available for the KT-10 and KT-20 and the parameters they are beneficial for:

Frequencies	KT-10	KT-20
1 kHz	✗	✓
10 kHz	✓	✓
100 kHz	✗	✓

The **1 kHz** frequency is helpful for measuring magnetic susceptibility on conductive samples. Measuring magnetic susceptibility in a low frequency reduces the impact of conductivity on the measurement, producing more accurate results on conductive samples, like graphite. This frequency has a lower sensitivity for measuring magnetic susceptibility (1×10^{-5} SI) and is not recommended for measuring conductivity.

The **10 kHz** frequency is ideal for measuring both magnetic susceptibility and conductivity simultaneously. It is commonly used for measuring magnetic susceptibility and conductivity as it provides good sensitivity for both methods.

The **100 kHz** frequency provides the highest sensitivity for conductivity measurements in low ranges, however is not suitable for measuring magnetic susceptibility.

4. What is the magnetic susceptibility sensitivity for the various KT-10 models and KT-20 sensors?

Refer to the charts below for the range of magnetic susceptibility sensitivities available.

KT-10 Models:

	Sensitivity Ranges *		
	1×10^{-7} SI – 1×10^{-6} SI	1×10^{-6} SI – 2 SI	2 SI – 10 SI
KT-10 v2	✗	✓	With Plus Upgrade
KT-10R v2	✗	✓	With Plus Upgrade
KT-10 H	✓	✓	With Plus Upgrade

* Refer to the KT-10 brochure for additional specifications pertaining to each of the KT-10 models

KT-20 Sensors:

The magnetic susceptibility sensitivity for the KT-20 system is dependent on the sensors being used with the KT-20 console. See below for a breakdown of the magnetic susceptibility sensitivities available with each applicable KT-20 sensor:

	Sensitivity Ranges *		
	$1 \times 10^{-7} \text{ SI} - 1 \times 10^{-6} \text{ SI}$	$1 \times 10^{-6} \text{ SI} - 2 \text{ SI}$	$2 \text{ SI} - 10 \text{ SI}$
10 kHz Single-Frequency <i>Circular</i> Sensor	✓	✓	With Plus Upgrade
10 kHz Single-Frequency <i>Curved</i> Sensor	From $6 \times 10^{-7} \text{ SI}$	✓	With Plus Upgrade
1/10 kHz Dual-Frequency Sensor	✗	✓ @ 10 kHz	With Plus Upgrade
3-Frequency (1/10/100 kHz), 32cm Diameter Sensor	✗	✓ @ 10 kHz	With Plus Upgrade

* Refer to the KT-20 general brochure for additional specifications pertaining to each of the KT-20 sensors

5. What is the conductivity sensitivity for the various KT-10 models and KT-20 sensors?

Refer to the charts below for the range of conductivity sensitivities available.

KT-10 Models:

	Sensitivity Ranges *		
	$0.04 \text{ S/m} - 1 \text{ S/m}$	$1 \text{ S/m} - 100,000 \text{ S/m}$	$100,000 \text{ S/m} - 200,000 \text{ S/m}$
KT-10 C	✗	✓	With Cx Upgrade
KT-10R C	✗	✓	With Cx Upgrade
KT-10 H S/C	✗	✓	With Cx Upgrade

* Refer to the KT-10 brochure for additional specifications pertaining to each of the KT-10 models

KT-20 Sensors:

The conductivity sensitivity for the KT-20 system is dependent on the sensors being used with the KT-20 console. See below for a breakdown of the conductivity sensitivities available with each applicable KT-20 sensor:

	Sensitivity Ranges *		
	0.04 S/m – 1 S/m	1 S/m – 100,000 S/m	100,000 S/m – 200,000 S/m
10 kHz Single-Frequency Circular Sensor	✗	✓	With Cx Upgrade
100 kHz Single-Frequency Curved Sensor	✓**	Up to 100 S/m	✗
10/100 kHz Dual-Frequency Sensor	From 0.1 S/m @ 100 kHz	✓ @ 10 kHz	With Cx Upgrade @ 10 kHz
3-Frequency (1/10/100 kHz), 32cm Diameter Sensor	From 0.05 S/m @ 100 kHz	Up to 10,000 S/m	✗

* Refer to the KT-20 general brochure for additional specifications pertaining to each of the KT-20 sensors

** The conductivity sensitivity for curved sensors varies based on the diameter of the sensor, with larger diameter sensors offering slightly improved sensitivity, as shown below:

- BQ Diameter – From 0.07 S/m
- NQ Diameter – From 0.05 S/m
- HQ Diameter – From 0.05 S/m
- PQ Diameter – From 0.04 S/m

6. What is the depth penetration for the KT-10 and KT-20 system?

The depth penetration for the KT-10 and the KT-20's standard sensors is approximately 4cm, with 90% of the readings coming from the first 2cm of a sample. The KT-20 can achieve greater depths when combined with the 3F-32 large diameter sensor. The 3-frequency (1/10/100 kHz), 32cm diameter (3F-32) sensor has a depth penetration of +/- 32cm (subject to the electrical properties of the soil, the frequency used, and the size and characteristics of the source being measured) and is recommended for agriculture, archaeology, and environmental investigations.

7. What upgrades are available with the KT-10 and KT-20 system and how do they work?

Upgrades	Description	Type	KT-10	KT-20
Plus Upgrade	Increases magnetic susceptibility measurement range from 2 to 10 SI units and includes iron ore concentration estimates (%) directly from the display for magnetite ore.	Remote	✓	✓
Cx Upgrade	Increases conductivity measurement range from 100,000 to 200,000 S/m.	Remote	✓	✓
S/C Upgrade	Enables the console to simultaneously measure magnetic susceptibility and conductivity.	Remote	✓	✓
Pro Upgrade	Increases the capabilities of the KT-20 IP sensor, including: Full waveform analysis up to 16,000 windows; initial chargeability (M _{ip}) calculated; decay analysis starting 2ms after switch off; chargeability calculations from user defined time intervals; 3 time constants (Tau) calculated; 3 exponential decay models; and Raw data recording.	Remote	✗	✓
Bar Code Option	Enables the KT-20 camera to read a variety of bar codes to facilitate archiving. An example of the bar code being used must be provided upon purchase.	Upon Purchase	✗	✓

All "Remote" upgrades are available upon purchase or can be added remotely via an online firmware upgrade, eliminating the need to send the unit back to Terraplus. Remote upgrades are accessed by entering an unlock code (provided by Terraplus) on the GeoView software or, in the case of the KT-20, on the device itself. Any upgrade added after the initial purchase is subject to an upgrade fee.

Note that all KT-20 upgrades apply to the console itself, rather than the individual sensors. For example, once a KT-20 console has been upgraded with the Plus functionality, all applicable sensors connected to the console will have access to the upgrade – including sensors purchased at a subsequent date.

8. What sensors are compatible with the KT-20 system?

There are a variety of sensors compatible with the modular KT-20 system. For measuring magnetic susceptibility and/or conductivity, the following sensors are available:

	Methods		Sensor Shapes Available		
	Magnetic Susceptibility	Conductivity	Circular	Rectangular	Curved
10 kHz Single-Frequency <i>Circular</i> Sensor	✓	✓	✓	✗	✗
10 kHz Single-Frequency <i>Curved</i> Sensor <i>(Available in BQ, NQ, HQ, or PQ Diameters)</i>	✓	✗	✗	✗	✓
100 kHz Single-Frequency <i>Curved</i> Sensor <i>(Available in BQ, NQ, HQ, or PQ Diameters)</i>	✗	✓	✗	✗	✓
1/10 kHz Dual-Frequency Sensor	✓	✓*	✓	✓	✗
10/100 kHz Dual-Frequency Sensor	✓**	✓	✓	✓	✗
3-Frequency (1/10/100 kHz), 32cm Diameter Sensor	✓	✓	✓	✗	✗

* The 1 kHz frequency is not suitable for measuring conductivity. We recommend that the 1/10 kHz Dual-Frequency Sensor be used by operators focused on magnetic susceptibility measurements.

** The 100 kHz frequency is not suitable for measuring magnetic susceptibility. We recommend that the 10/100 kHz Dual-Frequency Sensor be used by operators focused on conductivity measurements.

Other options include an **IP/resistivity sensor** for measuring chargeability and resistivity (available with either a small or large sample holder to facilitate measurements for various sample sizes) and a **density scale assembly** for measuring the density of a sample through water displacement.

9. Can I use the KT-10/KT-20 to measure small chips, pebbles, shavings, or powder samples (for example, drill chips from reverse circulation drilling)?

Yes. With some preparation, both the KT-10 and KT-20 can be used to measure the magnetic susceptibility and/or conductivity of small chips, pebbles, shavings, or powder samples. In order to make an accurate measurement, the samples should be formed into a bulk sample that is larger than the KT-10/KT-20's sensor (i.e. larger than the 66 mm diameter for circular sensors) with a thickness of at least 5cm (~2 inches). The samples can be aggregated in a thin plastic bag or glass container (e.g. Petri dish).

10. What are calibration and reference pads? Do I need one for my KT-10/KT-20?

Calibration/reference pads are used as a check source to verify the accuracy of measurements taken by the KT-10 and KT-20 systems, whether for magnetic susceptibility, conductivity, or IP/resistivity. Calibration pads have the added benefit of allowing users to recalibrate their magnetic susceptibility measurements. Although they're not required, these pads can prove to be useful tools in validating your measurements. Many groups have a policy of testing their KT-10/KT-20 units at the beginning and end of each work day. These pads are particularly useful when multiple KT units are being used on a project to confirm that each of them is measuring a similar value.

A variety of different calibration/reference pads are available depending on the method being measured. Each pad comes with a test certificate and is compatible with a range of different models. All of the pads are compatible with the KT-20 system, subject to the type of sensor being utilized, and all *Flat* magnetic susceptibility and conductivity pads are compatible with the KT-10 system. Although the pads are designed for the KT-10 and KT-20 systems, they can also be used with other instruments.

Magnetic Susceptibility Calibration Pads

	Flat		Curved *
	Low Range	High Range**	Low Range
Approx. Nominal Susceptibility Values (values will vary between pads)	34 x 10 ⁻³ SI	2,500 x 10 ⁻³ SI	95 x 10 ⁻³ SI

* Curved pads are available in BQ, NQ, HQ, or PQ diameters to complement the KT-20's curved sensor diameters

** To be used with the Plus Option only

Conductivity Reference Pads

	Flat			Curved *
	Low Range	Medium Range	High Range	Low Range
Approx. Nominal Conductivity Values <i>(values will vary between pads)</i>	9 S/m	700 S/m	85,000 S/m	18 S/m

* *Curved pads are available in BQ, NQ, HQ, or PQ diameters to complement the KT-20's curved sensor diameters*

IP/Resistivity Reference Pad

A dedicated reference pad, the IP-T10, is also available to verify the various measurement parameters shown below of the KT-20's IP/Resistivity Module.

Measurement Parameter	Unit of Measure	Nominal Values *
MxFit	mV/V	16.9 ± 0.4
MIP (Initial Chargeability)	mV/V	97.8 ± 0.5
R (Contact Resistance)	kΩ	99.7 ± 0.8
Total Tau (Time Constant)	ms	236.9 ± 4
A x 102 (Amplitude)	V/V	9.9 ± 0.1

* *Values will vary between pads*

Note: Measurement values are influenced by external factors, such as temperature, environment, and the operator's technique during the measurement sequence (e.g. the pressure applied on the sample during measurement). This may lead to slight differences observed between the measurement and the nominal value indicated for each pad.

For additional information, feel free to contact us at:

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Specifications are subject to change without notice (May 5, 2020)