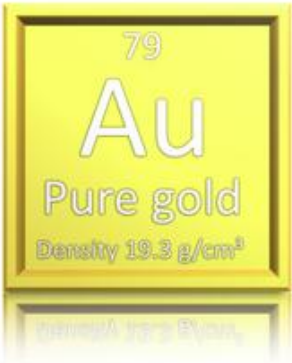
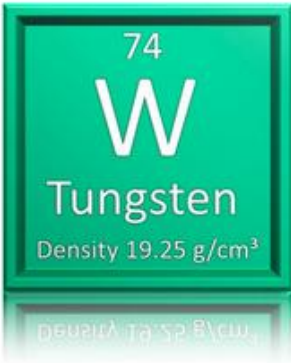



The methods of analysis for gold bars and gold jewelry -

Test gold reliably and safely

1. The problem with testing gold jewelry

The authenticity testing of gold jewellery is a major challenge. Due to the wide variety of geometries (rings, necklaces and ear studs, etc.) and the composition (different mixed gold alloys with different carat numbers), **it is impossible to determine gold jewellery exactly using just one test method**. The most common types of counterfeit jewellery are as follows:

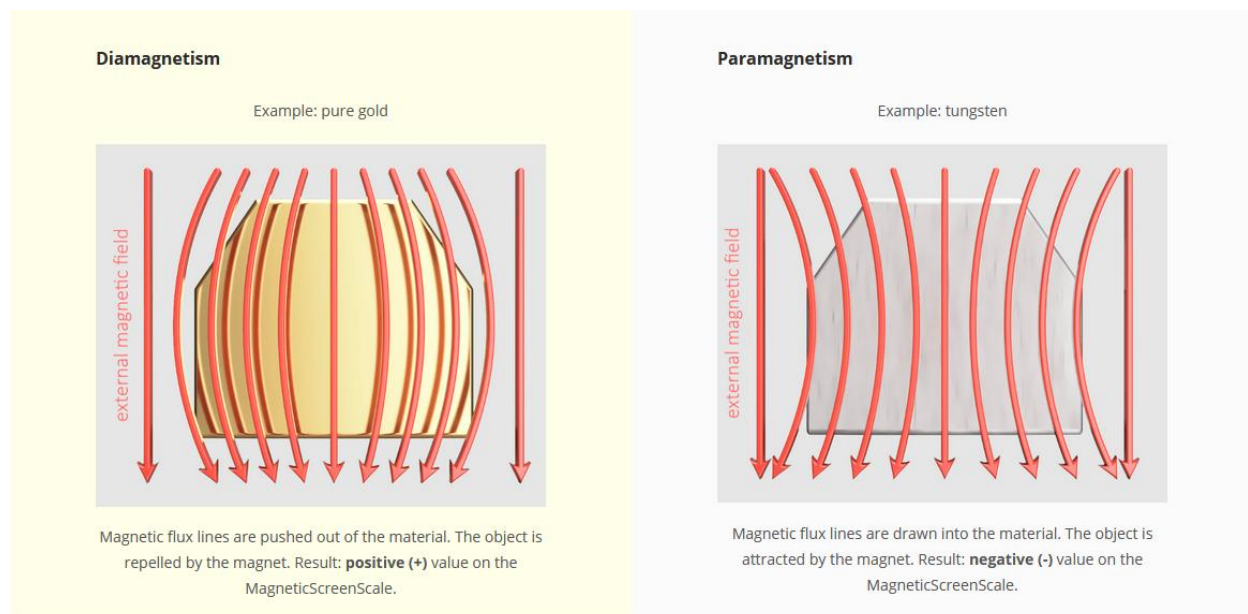
		
Pure gold	Tungsten	Tungsten-Copper (W/Cu) Alloy 95/5
Density: 19.3 g/cm ³	Density: 19.25 g/cm ³	Density: 18.5 - 18.9 g/cm ³

- Counterfeit jewellery with base metals: This refers to the coating of a base metal with gold. This often occurs with rings or chains made of wolfram or wolfram carbide, whereby these materials almost perfectly imitate the density and thus the "feeling of heaviness" and feel of real gold jewellery. One variation is so-called "motorway gold", an imitation made of mostly cheap steel or stainless steel coated with gold and often sold as real gold jewellery at motorway car parks.
- Under-alloying / hallmarking fraud: If the gold content of an alloy is lower than specified by the hallmarking/stamping, a not inconsiderable "surcharge" is paid when the piece of jewellery is purchased without being checked.
- This can also be done in an even more sophisticated way, in that the surface of the piece of jewellery has the correct alloy and the underlying material is worthless foreign material or an inferior alloy.

2. The test methods for gold bars

2.1. Magnetic Screen Scale

A sustainable method for measuring bars and coins is to determine the so-called **magnetic susceptibility properties**. This makes it possible to determine, even through blister packs and packaging up to a certain thickness, whether the applied material exhibits the correct magnetic behaviour - para- or diamagnetic, i.e. attractive or repulsive. A so-called "wolfram detector" can be used to determine the presence of a potential foreign body: a gold bar as a so-called diamagnet displaces a magnetic field, creating pressure on the measuring head of the scale and displaying a positive value. If a supposedly genuine fine gold bar is placed on the scale and a negative value appears, in most cases it is a fake.



2.2. Density Screen Scale

You can use the density scales to quickly and precisely determine the density of all types of materials. **They are equally suitable for analysing bars and gold jewellery to determine their purity and alloy composition** and to identify bars or pieces of jewellery that have been "stretched" or under-alloyed with silver or copper. The density is determined using the tried and tested method of Archimedes: To do this, the object is weighed with a sieve under water and once "normally". The density can be determined directly from the two different values. This gives you an insight into the quality and carat number of the gold or even an initial indication of the possible presence of forgeries. **Determining the authenticity and gold content of geometrically irregular objects such as pieces of jewellery is therefore no problem.**

3. Test methods for gold jewellery

3.1. Surface testing with test acids or X-ray fluorescence analysis

- a.) **The gold line test with test acids:** The first, relatively simple and inexpensive step is to determine the gold content using gold test acids. In the line test, an abrasion is made from the surface of the gold piece to be tested on a so-called test stone. Depending on the test situation, different test acids are then applied to this abrasion in order to determine the carat number.
- b.) **X-ray fluorescence analysis (XRF):** This determines the exact elemental composition of the jewellery on the surface. This method is very expensive (approx. EUR 15,000 - 45,000) and is purely superficial: the maximum penetration depth is only 0.010 mm. This means that only thin gold plating (decorative or flash gold plating) can be penetrated, but not hard lustre or even thicker gold plating.

3.2. Electrochemical testing using the "CaratScreenPen"

The CaratScreenPen uses an **electrochemical process to determine the purity and fine gold content on the surface of gold and platinum jewellery**. The measuring tip forms a so-called "galvanic cell" on contact with the object lying on the measuring surface. This results in a certain electrochemical behaviour, which is registered by the measuring tip and processed by the device. The value determined correlates with the carat number, which is output after a few seconds in the unit "K" (carat). However, the CaratScreenPen only analyses the condition of the surface. It is possible to examine the core of the respective object, but only to the depth at which you have filed or scratched the piece of jewellery.

3.3 Electrical conductivity test using the „GoldScreenSensor“

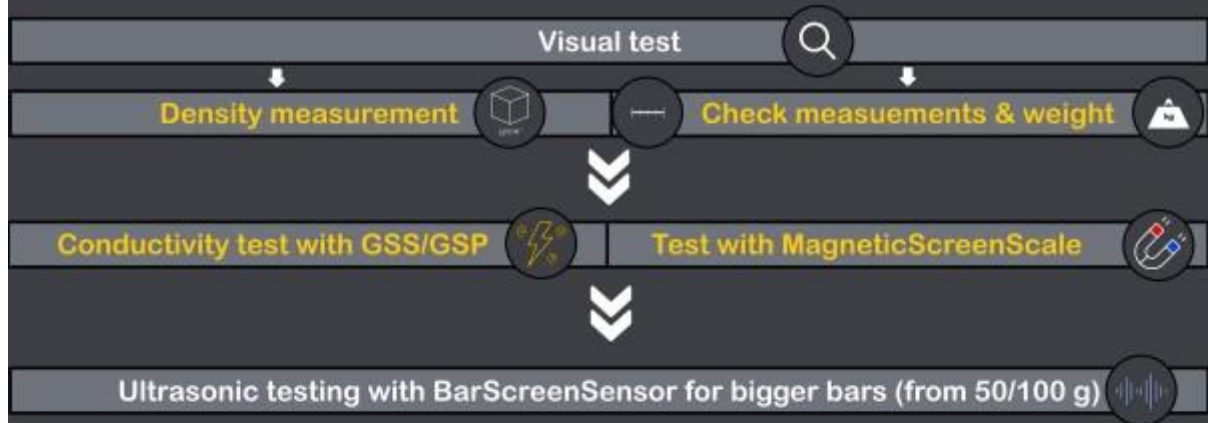
With the GoldScreenSensor, you can quickly and precisely check the authenticity of coins and small bars made of gold, silver and other precious metals - even through foils, blister packs and capsules. **The device measures the electrical conductivity of your test object, making it possible, for example, to clearly distinguish the particularly treacherous counterfeits made of tungsten from genuine fine gold coins.**

The penetration depth of the GoldScreenSensor depends on the conductivity of the materials and limits the material thickness that can be penetrated. Depending on the material and geometry, the manufacturer recommends using the GoldScreenSensor for coin objects in the range from 1/4 ounce to approx. 2 ounces.

3.4. Conclusion on the testing of gold jewellery

Due to the large number of different types of gold alloys and jewellery geometries, the testing of jewellery is more demanding than that of gold bars, for example. However, many forgeries can already be recognised with superficial methods, the use of a "CaratScreenPen" and/or a density scale. **It is always advisable to use a combination of at least two methods (density and conductivity).** Magnetic scales, on the other hand, are not suitable for checking jewellery due to the unfavourable geometry of the jewellery (exception: watch cases, watch covers or similar).

Coins and bars



Yellow = one of the two methodes beside each other, White = essential
Only a full chemical testing can give 100 percent security

Gold jewellery

