

*Annex to  
Press Statement*

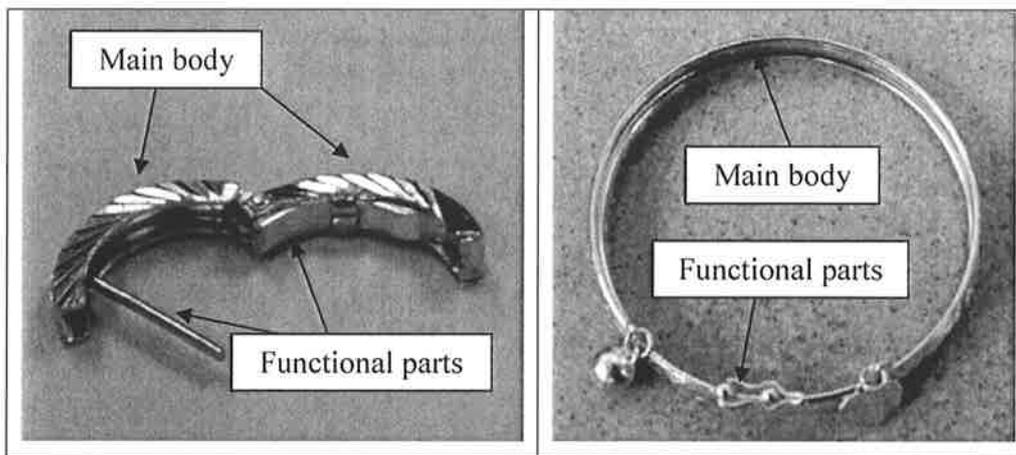
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## **THE MAKING OF A GOLD JEWELLERY**

Gold is the most malleable and ductile metal known. It can be melted and shaped into any design. This ease of workmanship, together with its beauty, made it a preferred metal for jewellery across the world for centuries. Pure gold, is considered too soft for use in jewellery. Fortunately, it can easily be alloyed with other metals to modify its hardness and ductility, melting point, colour, and other metallurgical properties.

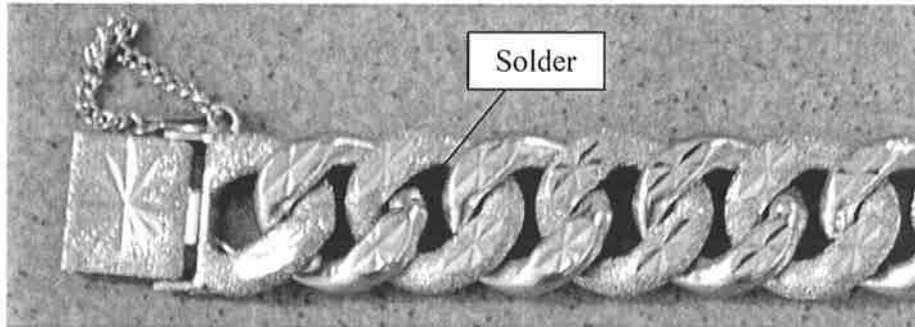
Typically, a piece of gold jewellery can be divided into 2 parts:

- a. The main body, which comprises of the bulk of the jewellery piece, and
- b. The functional parts, which comprises the parts that enable the main body to be worn. Examples of functional parts include the hooks for chains, pins and studs for earrings, hook or duck tongue for bangles, etc.



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At times, solder are also melted onto the gold to form links, as in the bracelet shown below:



24K gold refers to a piece of metal with 99.9% pure gold. 18K gold is 18/24parts, or three-quarters, pure gold, or about 75% pure gold. It is also commonly marked as 750 fineness by European countries. Hence, a 916 fineness gold jewellery means that it contained 91.6% pure gold for that particular jewellery piece.

While jewellers would have little difficulty in ensuring that the main body of a jewellery piece fulfilled its marked fineness, it would be more challenging to ensure that same fineness for the functional parts, due to practical reasons. A functional part that is of the same fineness as the main body, especially for 999 fineness gold, would not be durable for frequent wear. Hence, typically, functional parts come with a lower fineness, depending on the alloying needed to achieve the desired hardness and strength. The industry accepted fineness for functional parts ranged from 750 to 916 fineness.

There are several methods to check for gold fineness:

- a. Touchstone/Carat needles. This is an ancient gold testing method. The touchstone is a smooth fine grained, slightly abrasive black stone, usually quartz or jasper. It was used as the first method of assaying gold and was used at least as early as 500 BC. It compares scratch marks from unknown carat gold items against known carat gold needle marks using acid as part of the

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testing process. Touch stones and carat needles are still used today and can be purchased from jewelry supply houses. This is a quick method and precision ranges from 10 to 15% depending on the experience of the person conducting the test.

- b. X-Ray Fluorescence (XRF). This is a non-destructive technique which measured the intensity of the generated gold X-rays as well as other alloying metals present. However, it only measures the gold content on a thin surface layer, so accuracy is severely compromised where the jewellery has had a chemical surface treatment or has been electroplated with a layer of pure gold. It is usually used as a screening test, and the results are not taken as conclusive proof of fineness.
- c. Inductively Coupled Plasma using Optical Emission Spectrometry (ICP). In Optical emission spectrometry (OES) ISO 15093:2008, the sample is subjected to temperatures high enough to cause not only dissociation into atoms but to cause significant amounts of collisional excitation (and ionisation) of the sample atoms to take place. Once the atoms or ions are in their excited states, they can decay to lower states through thermal or radioactive (emission) energy transitions. In OES, the intensity of the light emitted at specific wavelengths is measured and used to determine the concentrations of the elements of interest. This is a destructive method and precision ranges from 1 to 2%.
- d. Fire assay. This is the standard reference technique used by the national Assay laboratories worldwide for Hallmarking and is based on the International Standard, ISO 11426. The principle is based on the removal of all base metals from a small weighed sample by oxidation in the cupellation stage to leave a pure gold-silver alloy, followed by removal of the silver by dissolution in nitric acid (the parting stage) to leave a residue of pure gold which is then weighed to allow calculation of the gold content. The method is destructive also but is the most accurate, achieving between 0.02% to 0.1% precision.

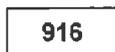
## **HALLMARKING SCHEME IN SINGAPORE**

Singapore Assay Office (SAO) is an independent test laboratory that test precious metals such as gold, silver, platinum and palladium purity since 1975. It was originally set up to support the Singapore Mint, but became independent in 1979. SAO is a department in Singapore Test Services Pte Ltd, a wholly-owned subsidiary of Singapore Technologies Kinetics Ltd.

The SAO Hallmarking Scheme is a voluntary scheme where manufacturers, traders, and retailers of gold jewellery submit their jewellery pieces to SAO for assaying and hallmarking. Under this scheme, SAO will first screen the batch of jewellery using XRF method where lower fineness items would then be sampled for Assaying (testing of fineness using Cupellation method). When SAO is satisfied with the fineness of the jewellery pieces, it will mark every piece with the hallmark to attest to its quality. The complete set of hallmark consists of the SAO mark which bears the symbol of a lion head logo, the standard mark which indicates the fineness as well as the jeweller's mark.

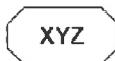


Assay Office Mark



Standard Mark

(Rectangle for gold, Circle for silver and Diamond for platinum)



Jeweller's Mark



In Singapore, hallmark is on a voluntary scheme unlike UK, where the British law, states that any article which is offered for sale in the course of trade and describes as gold, silver, platinum or

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palladium must be hallmarked. As there is currently no Singapore Standard for the testing of the fineness of precious metals jewellery, SAO adopts the International Hallmarking Convention standards as a guideline in the determination of Singapore's jewellery fineness content. On a yearly basis, SAO participates in the round robin testing of various laboratory methods conducted by the International Association of Assay Offices to ensure that our testing accuracy is comparable to that of the other assay offices internationally.

**Annex B**

Item : Baby bangle from Satya Jewellers



**TEST RESULTS**

Test Point, Pt	Tested Fineness of Gold in parts per thousand	Required Fineness of Gold in parts per thousand	Conformness to requirements	Remarks
1	912.8 908.6	916.0	✘	Body
2	904.4 906.7	800.0	✓	Wire (solder inclusive)
3	910.2 911.4 906.2	800.0	✓	Globe (solder inclusive)