

Given the elevated worth of jewellery and precious metals, there are several accounts of illegal production and fabrication of these metals. The social, economic, and governmental impact of precious metal counterfeiting is substantial. As it incites criminal activity and a black market, it generates jobs losses and loss of tax revenue for countries around the world.



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The assay offices in Portugal partnered with a research centre on human-centred digital technology to develop an innovative solution that could create unique and unclonable marks on metal artefacts to certify their authenticity, using a stamping process (punch marking) similar to that traditionally used for hallmarking precious metals.

OTHER MARKS

on metal artefacts that certify their authenticity.

A solution for creating unique and unclonable marks

assay offices which dispenses diamond microscopic powder particles onto a metal surface.

This solution comes in the form of a device designed for workers in the

particles are punched into the metal, embedding themselves in it and forming a random dispersion (like a QR code) that is both unique and impossible to replicate, thereby ensuring the authenticity and traceability of the marked object.

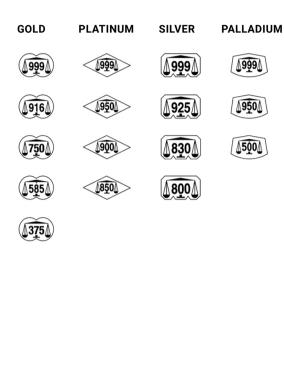
During the stamping process, these

999‰	999	999‰	999	PRATA	
950‰	950	950‰	950	PALÁDIO	
900‰	900	500‰	500	OURO	500
850‰	850			PLATINA	800
GOLD		SILVER		ARTICLES OF SPECIAL INTEREST	833
999‰ (24 k)	999	999‰	999		750 +METAL
916‰ (22 k)	916	925‰	925		+M
800‰ (19,2 k)	800	835‰	835		
750‰ (18 k)	750	830‰	830		
585‰ (14 k)	585	800‰	800		
375‰ (9 k)	375				

ASSAY OFFICE MARKS

PALLADIUM

PLATINUM



COMMON CONTROL MARKS

The Solution

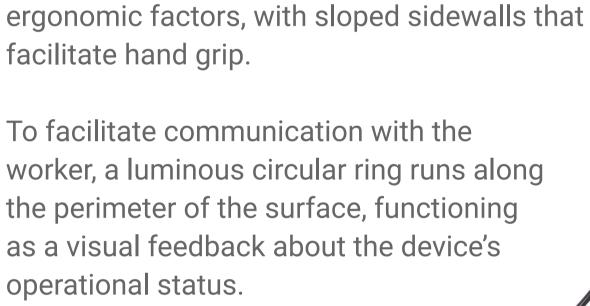


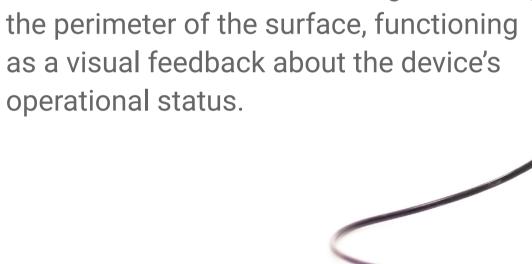
pedal, the adjustment potentiometer, and the power connector. Having studied the movements, workstations and work practices of workers in the assay office, the design of the surface considers

components, and a rectangular protrusion that contains the control interfaces — the activation

The design departs from the formal and symbolic language of the solitaire ring and is

composed of two elements: a circular, compact, and stable base that houses all electronic



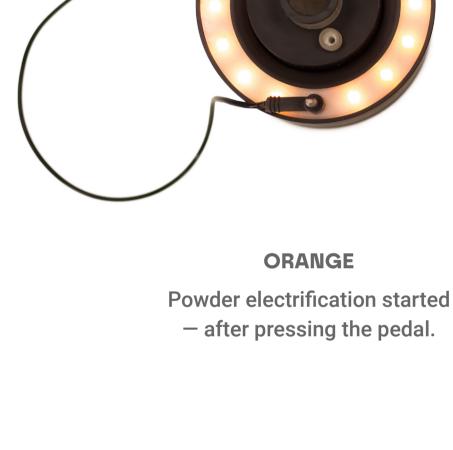




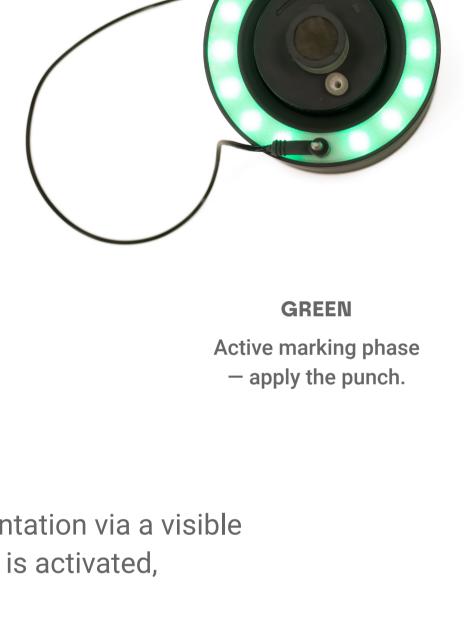
Device Status



enabling even dispersion of the powder.



The second element, designed to fit into the base in a single orientation via a visible rectangular protrusion, remains free to vibrate when the function is activated,



onto a metal platform, where the diamond particles are positively charged. At the top of this platform, a circular opening allows for quick attachment of a removable component,



different sizes to fit various punch tools. The punch tool is inserted into this component and positioned at a precise distance from the charged diamond powder, ensuring that the correct amount of particles adheres to the tool to form a precise marking. The punch tool is electrically grounded through a flexible cable connected

to the main device, enabling the attraction of

The powder falls from a central reservoir

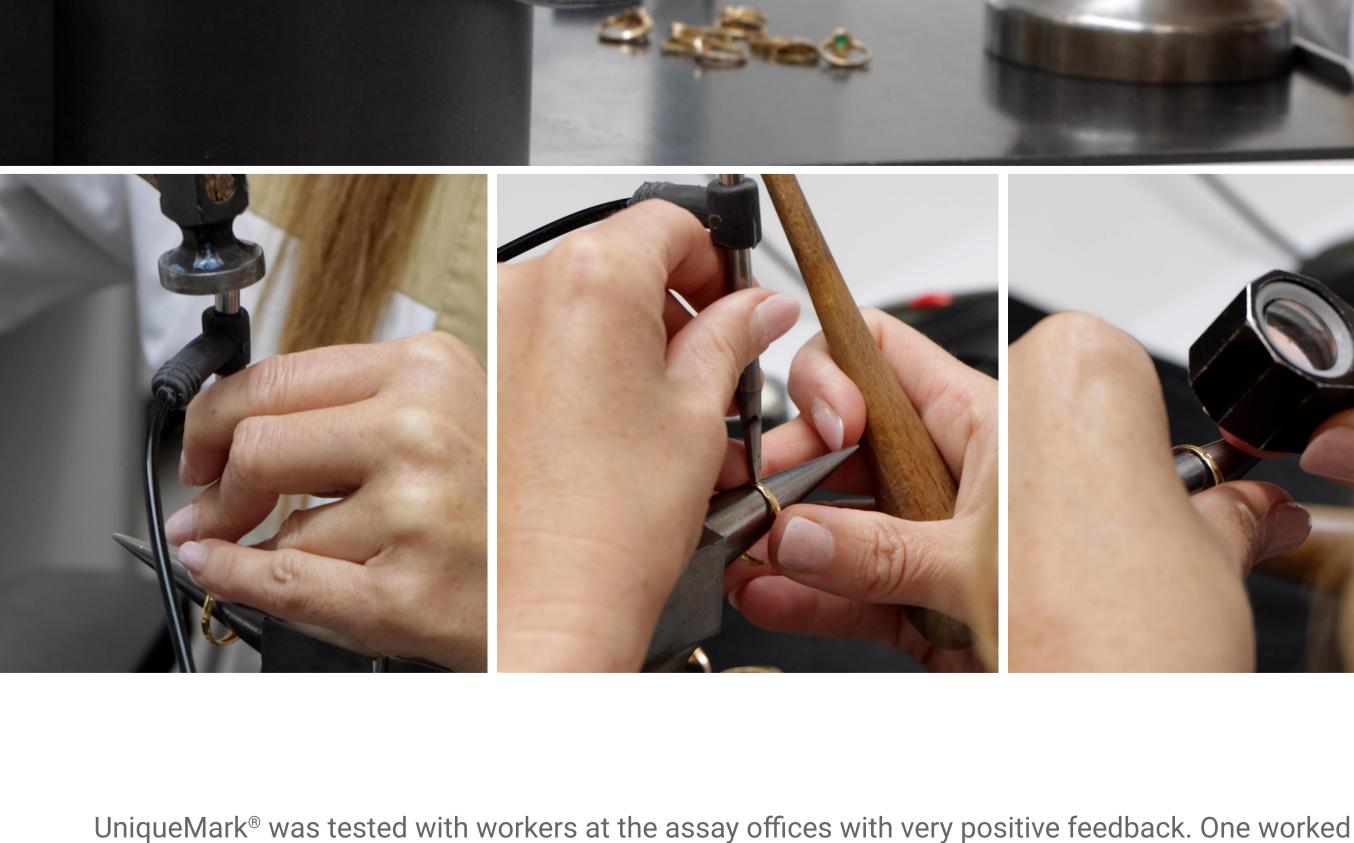
which can be replaced with others of

the positively charged diamond particles to its surface.

element, the electrical connection can be made at any point along the vertical axis of the punch, allowing greater flexibility and better adaptability during use.

Since silicone contains an internal conductive







commented that he sensed the punch tool had the adequate amount of diamond powder for the

task. The design, intended to respect and value workers' skills while ensuring optimum technical

performance of the electronic components, demonstrated to be usable and useful.

