# INSCRIBED IN STONE

Laser engraving is a time-tested method for identifying diamonds, and innovators are working to make the process cleaner, safer and more secure. BY SARAH JORDAN

Using lasers to mark a diamond is an industry-wide practice. Interchangeably called laser engraving or laser inscribing, the process involves applying a grading report number or branded feature to a diamond — typically in an unobtrusive place such as the girdle — to confirm and secure its identity.

"It allows [consumers] to verify that the stone matches the diamond report," says Roland Lorie, CEO of the International Gemological Institute (IGI), adding that the Antwerp-based laboratory "is a strong advocate for laser engraving."

De Beers table inscription from the Code of Origin Trusted Source Programme and Forevermark.

IMAGE: DE BEERS INSTITUTE OF DIAMONDS

## HOT AND COLD

Lasers available in the sector can be loosely separated into "hot" and "cold" — the main distinction being the wavelengths they use.

Hot lasers operate at a wavelength above 220 nanometers and can reach as far as the infrared range, according to David Benderly, president and CEO of PhotoScribe Technologies, which produces custom laser systems. This means the beam "is able to penetrate through the surface of the diamond and into the stone itself," he says — though this can cause "stress in the crystal and micro-fractures." For that reason, stones undergoing the hot laser process get a pre-treatment to protect them from such fractures.

In contrast, cold laser ablation processes, like those of PhotoScribe's LMS SurfaceScribe devices, do not transfer heat to the surrounding diamond material. This method leaves behind a "smooth and stress-free surface," Benderly explains. "Cold lasers do produce a better-quality mark. For a laser to be 100% safe for diamond inscription, it needs to be in the deep ultraviolet (UV) range, such as a 193-nanometer laser, and have a short pulse duration."

The longer pulse duration of hot lasers means the diamond is exposed to the laser's effects for longer, which increases the potential for fractures in the stone.

## MARK OF DISTINCTION

Both types of lasers use a beam of photons to "burn" marks into the stone by converting the diamond into graphite and amorphous carbon. This creates a high-contrast black inscription that's readable through a loupe or microscope. Understandably, most prefer to put these dark marks on the girdle rather than in a more visible spot.

However, British laser technology company Opsydia recently launched its D4000 Surface ID system, which focuses on improving the process and the outcome. "We have developed a laser process that can create transparent and ultra-high-precision features by clean ablation at very shallow depths of less than 50 nanometers and at faster rates than existing technologies," states Opsydia CEO Andrew Rimmer.

Crucially, this doesn't create the conditions to convert carbon to graphite, and therefore avoids black marks. "Our Nano IDs are placed sub-surface to secure a diamond's identity. They do not affect clarity grades and are not viewable with a standard grading microscope," Rimmer says.

## METHOD EVOLUTION

Sub-surface methods that go beyond girdle inscriptions make for some promising possibilities. For instance, says Lorie, "the engraving of a QR code, while only a few microns in size, is doable. Technology is constantly improving, and we anticipate seeing more of this in the market."

Still, he cautions, laser engraving "cannot be solely trusted [to authenticate a stone], as there are fraudulent laser inscriptions. Consumers need to purchase from a reliable jeweler and verify their report online. Another level of security IGI offers is the tamper-proof seal [for graded diamond packages]."

In that vein, De Beers Institute of Diamonds is channeling its energies into a "proprietary inscription method" on the table surface of diamonds. "It's about moving beyond the standard lasers, as this old technology can be easily replicated," explains Jamie Clark, the institute's head of global operations. "Table or surface inscriptions use non-laser technology to remove microns of diamond material without losing any weight, even up to six decimal points, and does not have the carbonized effect."

De Beers has not revealed the details of its technique. However, one non-laser method that has a similar effect is using focused ion beams to bombard substrates with electrically charged particles, removing material atom by atom rather than burning it away. This nano-marking technology is in use at Chow Tai Fook and underpins the Hong Kong-based jeweler's T-Mark collection, which it first announced in 2017.

What's clear is that laser engraving, ubiquitous in the diamond industry, is now serving as a launchpad for innovations that reflect the market's ongoing drive toward traceability and transparency. ■