Grayscale Marking: High Throughput with Very Good Quality

Around the globe, laser systems are marking more and more ID cards and other documents. The major reasons for the growth in laser marking are the laser's ability to write both text and high-resolution grayscale images at low cost, and the superior anti-counterfeiting characteristics of laser marking.

At the LASER 2007 World of Photonics in Munich, Coherent Inc. will be demonstrating the possibilities of laser marking technology with a marking system in operation on its show stand. The core element of the Coherent marking system is an end-pumped vanadate PRISMA series laser – the PRISMA 1064-16-V. Nd:YVO4 is preferred for laser marking because it has a much lower excited-state lifetime and a higher emission cross section than Nd:YAG. These properties result in high
repetition rates and short pulse widths. The end-pumped system also guarantees a stable beam with excellent beam qualities and low amplitude noise. Furthermore, end-pumping maximizes the overall electrical-to-optical efficiency, and extends the lifetime and reliability of the system. The PRISMA laser operates in the near-infrared region at a wavelength of 1064 nm. By using a plastics material, which is transparent for this wavelength, as an upper layer, the laser can mark ID cards on their subsurface.

Alternatively, it is possible to create micro-characters or tactile marking by modifying the substrate surface. All these capabilities greatly enhance the safeguards against counterfeiting, because the reproduction of laser-produced images by using other methods is virtually impossible. There are two basic methods used to add data to the card: vector scanning or raster scanning.

In vector scanning, the laser beam traces a marked pattern as a series of lines and curves. Vector
marking is usually just black and white (dot or no dot), and the dots are overlapped to produce the appearance of solid lines rather than dashed lines. This technique allows high-speed marking and is most commonly used for producing characters, numbers and barcodes.

Raster scanning in contrast, enables grayscale marking. First, the desired mark is digitized as a rectangular array of grayscale pixels. Then, by tracing a series of closely spaced horizontal lines, that cover the entire field to be marked, the laser beam writes the pixel pattern on the workpiece. Each circular
pixel is created by a single laser pulse that has been modulated to produce the necessary gray level. This raster method is most useful for rendering complex images such as photos, fingerprints and logos.

For most raster-scanned documents the laser repetition rate is between 60 kHz and 100 kHz, making it possible to mark picture IDs in a little more than three seconds. FOBA Technology + Services GmbH
has just finalized the development of its new DP30GS marking system, which uses the new PRISMA 1064-20-V. "With this laser we can mark from left to right and vice versa. Writing bi-directionally saves us 25% of production time, plus we also benefit from the power increase of the new laser", explains Marcus Geck of FOBA.

Tobias Pflanz, Product Marketing Manager at Coherent, explains: "The PRISMA design concept meets the practical needs of our card-marking customers. By using a "U"-shaped resonator, the footprint is minimized, making the laser head only about 400 mm long. And all resonator components are mounted on a thermally stable base-plate. The result is a design that exactly matches the requirements of a specific application."

"To demonstrate the speed and marking quality of our PRISMA lasers, we will be laser-marking free customized luggage tags for visitors on our booth at LASER 2007", concluded Pflanz.