The perfect tool for precise glass marking

MLase Excimer Laser

The Laser

Excimer Lasers are gas lasers emitting short light pulses at about 10 to 30 ns length. The short wavelength ultraviolet emission at e.g. 193 nm or 248 nm allows for non-thermal interaction with the target material – like glass – facilitating very precise processing. Other typical Excimer Laser operating parameters are pulse repetition rates up to 1 kHz and pulse energies at 10 to 16 mJ. Currently there is no alternative light source for such high pulse energies at such low wavelengths. Other common Excimer Laser wavelengths are 157 nm (F_2), 308 nm (XeCl) and 351 nm (XeF).

Integrated into a processing machine with dynamic x/y beam deflection (galvo scanhead) and focussing optics (F-Theta lens) the Excimer Laser beam source becomes a UV laser marking system. The wavelength and the beam path configuration influence the laser focus spot size. This limits the smallest structure size which can be processed with the laser. Beam path configuration is done by selecting appropriate components like beam expanders, telescopes, apertures and DEOs (Diffractive Optical Elements).

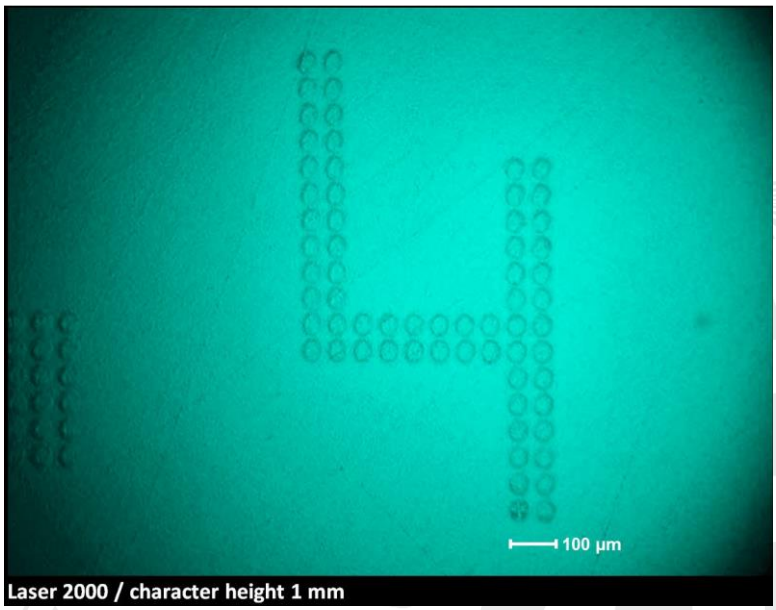

Figure 1: Marking on silica glass substrate

The Excimer Lasers from out renowned laser manufacturer **MLase** are very compact standalone devices which offer the best commercially available life times and reliability at the lowest running costs. Their homogeneous beam profile and active energy stabilization enables them to be utilized for the most demanding applications.

Simple connection via USB and control with the included software allow quick setup and easy Integration. Customized OEM versions with individual features based on the standard products can also be offered. Integrators benefit from standardized interfaces and a strong local support team. That way these lasers are used in automated manufacturing lines for mass production.

The Glass

The tasks at glass marking are to modify the surface, sometimes including hard coatings, or the bulk material. Usually the requirements for the markings are to be durable, unobtrusive and unremovable.

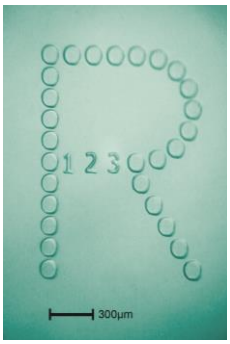

Figure 2: Insert-marking „123“

Typical marking content:

- alpha numeric characters
- logos
- inserts (e.g. small graphic elements inside larger logo)
- transparent engraving
- datamatrix codes
- brandings
- signatures

The Excimer Laser is able to create machine-readable codes on glass within a few seconds. Usually this technology is integrated in a manufacturing line or used as a mobile standalone system.

Mechanical processing of glass is very limited due to its brittle material characteristics. During laser marking the laser beam pulses interact with the material and change the surface by evaporating (removing) small material volumes. That way user-defined modifications can be applied on the glass surface like readable markings, functional structures or delicate decorations.

Alternative laser technologies like CO_2 or solid state lasers cannot be used on glass because their thermal input into the material causes melt points and the thermo-mechanical stress can cause cracks in the material. Thus, precision laser processing of glass has its own challenges in terms of minimizing the HAZ (heat affected zone) and mechanical stress. To control these effects the laser characteristics should be dominated by short pulses and a short wavelength in the uv spectrum range. The short pulse length helps keeping the thermal influence to a minimum. The short wavelength offers the following two benefits:

a) The wavelength directly determines the smallest possible focus spot size (shorter wavelengths for smaller spots) and thus the smallest structure sizes which can be processed. Example: Nanolithography in semiconductor chip manufacturing.
b) The high photon energy of the short wavelength is also beneficial for “cold” ablation and thus further helps reducing HAZ.

The Excimer Laser is the tool which complies best with the discussed requirements. It proves ideal for economic fine processing of demanding materials like glass.

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