Press Release

TRUMPF Group
Press and Public Relations

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As Permanent As a Tattoo

Laser marking of plastics

Ditzingen/Germany, October 24, 2007 - Laser marking is a high-quality, economical and extremely flexible way to mark information on plastic components. The broad-ranging application potential for the laser marking of plastics is far from exhausted. By further spreading of the frequency-doubled and frequency-tripled systems and the multitude of possible material/process combinations, laser marking will become still more common on the market. Together with its reliability and its applicability on almost all polymer materials, laser marking is the marking process of the present and the future.

Product documentation and traceability requirements are continually on the rise. Applying numbers, text, logos and codes is part of everyday life in the plastics-processing industry. Laser devices with varying wavelengths and active laser media satisfy modern production requirements with their high processing quality and efficiency. In contrast to traditional engraving, inscribing, edging or printing methods, laser marking’s great flexibility makes it a superior choice.

UV wavelength is opening new dimensions

Marking lasers emit light within the infrared wavelength range of 1064 nanometers. TRUMPF also has devices with green (532 nm) and ultraviolet light (355 nm) that can be used specifically to process plastics and semiconductor materials. The UV wavelength is opening up new dimensions in plastics marking. This shortwave light reacts directly with plastic compounds without heating the material and damaging it. Particularly in the case of critical

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materials, these lasers have a higher contrast-rich marking quality and operate at a greater processing speed.
While at 1064 nm, thermo-chemical reactions (carbonisation) dominate the laser marking process, at 355 nm (triple frequency), mainly photo-chemical reactions take place, i.e. chemical bondings are broken due to high photon energy. Therefore, markings produced at 355 nm are often also referred to as “cold marking”. Laser marking with this UV wavelength is also well suited for fire-resistant plastics which are used in the electronics industry for housing materials. A particular advantage of the 355 nm wavelength is also the low material influence and minimal surface damage through microcracks or foaming of the material.

Application areas for laser market spreading rapidly
Lasers can mark plastics in four different ways. The right marking format depends on the specific marking requirements and the plastic used.

For most thermoplastic materials, a change in color (mainly at a wavelength of 532 and 355 nm) is achieved through carbonization – dark marking on a light background – or by foaming the material (mainly at a wavelength of 1064 nm). When the matrix material is melted, gas bubbles form that are sealed in during cooling. The result is a raised marking that appears light on the darker plastic.

Engraving is a common choice for marking duroplasts and elastomers (mainly at a wavelength of 532 and 1064 nm). During this process, the laser melts the material on the surface, vaporizing it. Another option is to remove surface layers. Contrast is created when the surface layer is peeled away from the base material or base paint color.

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In the color change method (mainly at a wavelength of 532 and 355 nm), specific molecules, for example color pigments, are destroyed or structurally altered by the laser beam. A change in color or a fading of the material is visible in the areas processed. The surface of the material remains almost completely undamaged. To target the plastics precisely, the material and the laser wavelength must be optimally coordinated.

Laser – an economical and extremely flexible marker

The marking process is validated in an ideal manner: in close cooperation with the application lab of TRUMPF. Aspects such as wavelength, marking quality (contrast, homogeneity, resolution, clarity), marking time and, most importantly, customer preferences play a crucial role in finding the appropriate marking laser and the optimal parameters. These variables determine the number and quality of produced parts and the cycle time.

Marking lasers at K 2007

TRUMPF will demonstrate a variety of TruMark series marking lasers at K 2007 in Hall 04, Booth D39. TRUMPF will also premier the second model of the TruMark Series 3000, the new TruMark 3130, at the trade show. The TruMark 3130 is a laser marker geared toward high precision applications such as day/night design. At the K 2007 show, TRUMPF will demonstrate how cell phone key pads or illuminated switches in automobile fittings are marked.

The new TruMark 3130’s small processing head makes it compact just as the TruMark 3020. Scanner, laser head and power supply unit with hybrid cable are connected via plugs which also makes it easy to integrate. The TruMark 7020 with optical fiber coupling, optional outlets and homogenous beam profile enables marking that

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features clean edges. This flexible, robot-compatible system can also weld plastics and solder.

Another trade show highlight is the TruMark 6330 system with 90-degree twin head and a wavelength of 355 nm (UV light). The TruMark 6130 offers “marking on the fly”. This option allows parts to be marked on the fly, for example on a conveyor belt. Applications include small electronics components as well as hoses and cables that can be marked during automated processing. Furthermore, with a green wavelength of 532 nm, the TruMark 6230 possesses the laser wavelength that is most suitable for the majority of plastics available on the market.