

Micro- and Nanostructuring of Steel Inserts for Aesthetics and Security in High Volume Industrial Injection Molding

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In 2016, CSEM continued the development of its steel technology. For the first time, CSEM not only supplied the nanostructuring of steel inserts itself, but also supplied a brand new set of steel mold inserts "Made in Switzerland" – all from one source. All inserts were fabricated in Switzerland according to the client's specifications, and finally delivered with two different holographic designs within only 3 months; injection molding tests and optimization phase with on-site support in South-Korea included.

Since many years CSEM has gained experience and continuously advanced its steel nanostructuring technology. That technology allows to fit steel surfaces with custom designed optical nanostructures for either security or aesthetic purposes, or both.

Most commonly CSEM's steel nanotechnology is used to structure steel inserts for the use in high volume injection molding, since these steel inserts show significantly less wear compared to nickel shims and even can be made with curved surfaces and with cavities. The range of possible structures is wide and goes from static and dynamic color effects, microtext / microimages over hidden laser readable images to 3D effects like visual depth, lens effects or bas-relief.

Figures 1 and 2 show one of the latest deliveries of CSEM to an industrial client in South Korea. In this case the fabrication of a set of mold inserts as well as writing of the different designs into the steel was supplied by CSEM as a one-stop service.

Figure 1 shows a photograph of the first of the two designs. Shown is a mold insert with a 40 mm diameter top surface. The hologram consists of two images, which are shown in a) and b).

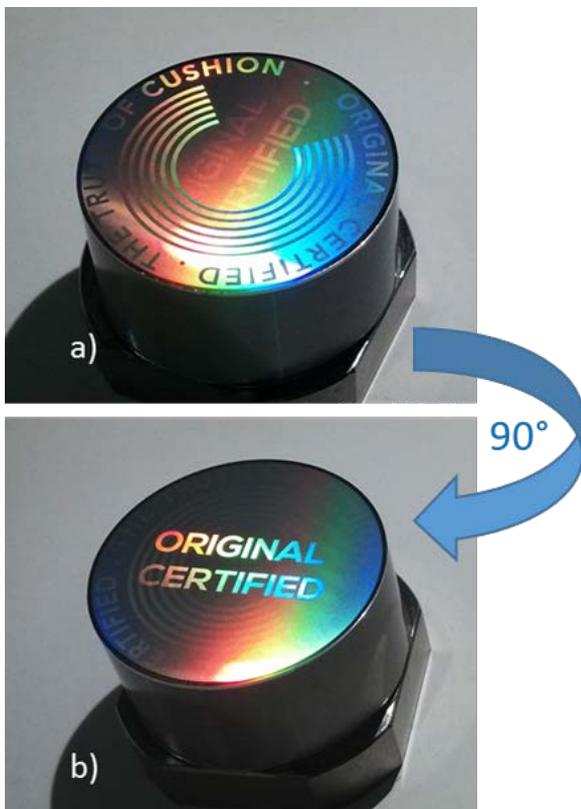


Figure 1: Hologram with switching effect on a 40 mm steel insert for injection molding. a) First main image is shown. b) In-plane turning by 90° the second image.

The first image showing the "C" logo disappears and the second image "Original Certified" is revealed if the sample is

turned in-plane by 90°. The other non-visible security features must be kept confidential.

Figure 2a shows a mold insert with the second design. It consists of logo with the lettering "HERA" which is filled with a specially designed diffractive nanostructure. The insert has the same dimensions as the one in Figure 1.

If a part of the HERA lettering is illuminated with laser light at the correct angle the custom designed image "The truth of cushion" is revealed. Figure 2b shows a picture of the projected image on a piece of paper at a distance of roundabout 15 cm.

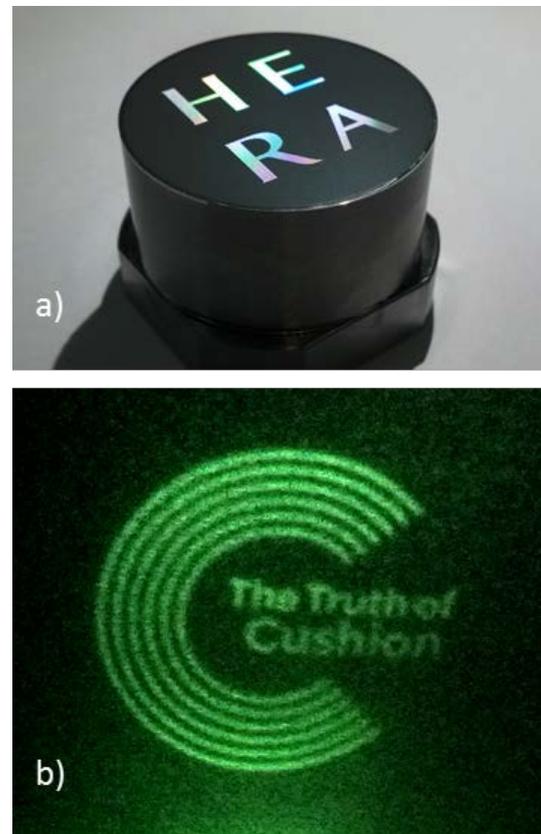


Figure 2: a) HERA logo with diffractive nanostructures on the steel insert. b) Photograph of the hidden image that is projected if the logo is illuminated by green laser light.

All pictures shown have been horizontally mirrored in order to allow a more comfortable reading of the lettering. Actually all holograms on the steel inserts are wrong reading in order to form right reading images on the molded plastic pieces.

This industrial project was conducted in collaboration with Sergio Lizzola and his company LK Forensic Competencies LLC, Chemin des Cerisiers 15, 1860 Aigle, Switzerland.