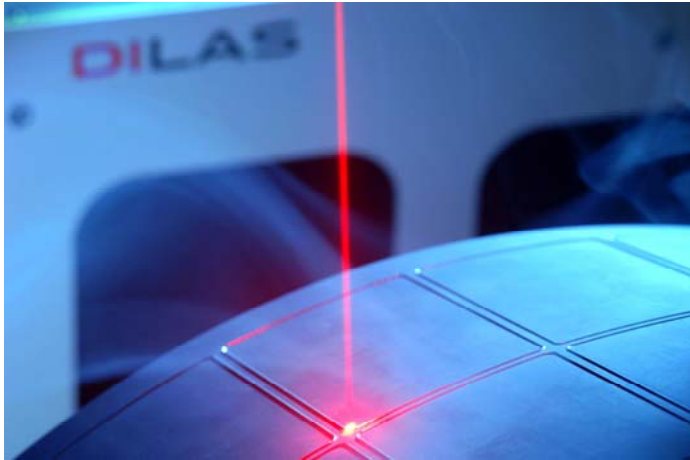


▶▶ PARTIAL HARDENING OF FUNCTIONAL SURFACES



Aside from conventional hardening methods, the market share for lasers in functional surface hardening is increasing. The advantages over traditional methods such as oven-, case-, flame-, or induction-hardening are numerous. The wear characteristics of an existing component are locally improved by hardening.

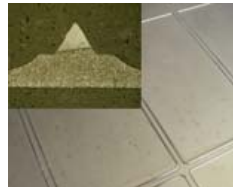
Lasers can be used to harden **cutting edges, tracks and guides, grooves, free form surfaces or counter sunk bore holes**.

Overview of process advantages

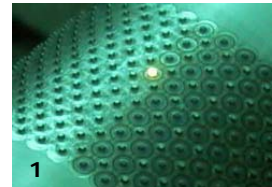
- contactless energy deposition
- highly defined energy deposition and hardness
- self cooling through thermal conduction
- stable process
- crystalline hardening structure
- controllable process
- contactless temperature measurement using pyrometry



Highly defined hardening area



Exact hardening of delicate parts



Selective hardening of functional surfaces

1 Courtesy of Stiefelmayer-Lasertechnik GmbH und Co. KG

Precisely defined hardening at the right place

In surface hardening using laser radiation, the material (carbonic steel) is heated above the austenitization temperature for a short time. Through rapid cooling the steel reaches the martensitic material structure. Heat deposition is realized through the absorption of laser radiation at the surface of the material, whereas cooling occurs conductively within the remaining material. The thermal gradient is mainly defined by the laser spot geometry and the feed rate.

Diode lasers are especially suited for hardening applications due to their homogenous beam characteristics and their high absorption on metallic surfaces.

When compared with conventional hardening methods such as oven-, case-, flame or induction hardening, laser hardening is marked by a range of advantages such as the spatially and temporally limited energy deposition.

▶▶ PARTIAL HARDENING OF FUNCTIONAL SURFACES

All conventional hardening methods require quenching with water, oil or salt bath.

When using oven- or case hardening, the whole component is heated, resulting in very long heating times what is often combined with through hardening of the entire part. This is especially problematic with small and delicate parts.

Flame hardening affects a large surface. However, this process is not very well defined and does not allow for temperature control of the process.

Induction hardening enables selective hardening at specific places of a part. A thermal deposition in adjoining areas, however, cannot be avoided which often has detrimental effects on the mechanical properties of the part. When changing the part geometry, the geometry of the inductor is also necessary.

Laser hardening on the other hand allows for a highly defined zone of influence without affecting neighboring surfaces. High cooling rates make fine structures and high levels of hardness possible. Intricate contours are easily hardened using lasers due to the flexible beam guidance possibilities. This also makes it possible to harden parts directly where it is required.

Products



COMPACT
Diode Laser System

The COMPACT is a diode laser system in a standard 19-inch format. The modular concept enables the integration of various diode laser modules with output powers of up to 500W with a standardized interface and footprint.



Processing Optics
PHFS9 including
camera and pyrometer

Tailored accessories, such as processing optics at various focal lengths, homogenous beam profiles and scanner heads, that are optionally equipped with pyrometer, complete the product range, making this system the perfect tool for partial hardening of functional surfaces.