LASER STRUCTURING
SURFACE STRUCTURES – FUNCTIONALITY AND DESIGN

Structured surfaces have an effect on the technical function, the feel and the look of components. In this context, the use of laser structuring opens up completely new possibilities: technical microstructures lasered into component surfaces can reduce energy losses in high-wear systems and improve their efficiency.

The field of mold and die making is ripe with applications that can benefit from structured surfaces: for instance, the channels that serve to vent injection molds in order to reduce burr formation. Plastic components with design structures, such as those one finds in cars, make a better impression than simple, smooth surfaces. Different structures can also be seamlessly combined with another.

The advantages of laser structuring

- Large, structured component surfaces with small, geometrically-defined and high-resolution structures
- Unlimited design freedom for the first time when designing surface structures
- The introduction of different and specific surface functions is possible
- Highly reproducible

Our offer

- Competent technology and system advice
- Feasibility and profitability studies
- Individual process implementation for industrial applications
- Laser structuring service for small and medium-sized product series
A COMPREHENSIVE PROCESS CHAIN – FROM THE DATA MODEL TO THE LASER-STRUCTURED COMPONENT

The Fraunhofer IPT has developed an entire digital process chain with which to structure surfaces using lasers. The surface is already designed during the product development phase. This makes it possible to check the effects of the design in a 3D model at an early stage. The digital structure is defined in a CAD system and projected without distortion onto the model of the surface. A CAM module, which the Fraunhofer IPT has developed specifically for this purpose, automatically generates the processing data from the 3D model of the structured component in well-established NC formats for the laser structuring equipment. The structuring procedure is then an automated, reproducible laser-structuring process with no need for subsequent rework.

Advantages of the comprehensive process chain

- Entirely digital modeling of structures and structured surfaces
- Creative structural design at the PC
- Very true to model and high degree of detail
- Highly automated data processing and administration within the integrative CAx process
- Comprehensive solution avoids data conversion errors
- Implementation of a highly automated process

Our specialties

- Link between process-related expertise and the latest CAx technology in an enclosed process.
- Modification of any structure to match complex component surfaces
LASER ABLATION – AN INNOVATIVE SURFACE STRUCTURING PROCESS

With a pulsed laser source and a highly focused laser beam, it becomes possible to generate very strong radiation intensity on the component surface. The surface material either evaporates or sublimes, depending on the pulsing. The Fraunhofer IPT uses different laser sources for the ablation process: nanosecond lasers as efficient and cost-effective all-rounders and picosecond lasers for ultra-precision processing to high standards of quality and accuracy.

One use of laser ablation is laser structuring, which has significant advantages compared to conventional structuring processes.

Advantages of laser surface structuring

- Highly reproducible results, even on surfaces with complex forms
- Use of lasers as wear-free, low-maintenance and flexible tools
- Processing of different materials is possible
- Highly flexible in the design of microstructures and surfaces

Our specialties

- Seamless structuring without distortion on complex component surfaces
- Entire digital laser surface structuring process chain
- User-friendly operation of hard and software, no specialist knowledge about laser technology is needed
- Successful transfer of process into industrial applications

Our offer

- 5+4 axis laser structuring of structures onto complex components using different laser sources (pico and nanosecond lasers)
- Advice on technology that meets your individual needs
- Adaptation and integration of the process into your production environment
- Feasibility and profitability studies
- Laser structuring of small and medium-sized series
INTEGRATED SOFTWARE SOLUTION FOR LASER STRUCTURING

It is no longer enough to develop new technologies and transfer them into industrial applications – they must now be fully integrated into the value-adding chain to ensure economic success. Even the best technology will not survive in the market if it is not user-friendly in practice. The Fraunhofer IPT has developed an integrated software for the laser structuring process that is easy to use.

Advantages of the integrated software solution

- Representation of the entire digital laser surface structuring process chain
- Digital determination of surface structure in a CAD/CAM system
- Design of surfaces already at the product development stage
- Highly reproducible due to the traceability of all data

Our specialties

- User-friendly operator interface with only minimal training required
- No special knowledge about laser technology is required in order to operate the software
- Linked to a process and technology database
- Processing data in common NC formats, e.g.: Heidenhain iTNC, Sinumerik 840D, ISO-NC, Siemens PLM Software CLS, CATIA APT and in other dialects
- Seamless integration of the software module into existing software systems such as Siemens PLM Software NX, CATIA

Our offer

- Development of software solutions for calculating laser structuring process data and for real-time control of laser structuring equipment
- Support during on-site software implementation
- Software training and workshops
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