Precise material processing with ultrashort pulse lasers

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Precision ablation with ultrashort pulse laser radiation has now become an industrially introduced technology that has found applications in a wide range of industries. The most significant advantages are the high lateral accuracy, the low energy input, the workability of almost any material as well as the flexibility of the machining process. Due to the exact energy deposition and the high geometrical flexibility, the laser processing is ideally suited for the digital production.

Pulsar Photonics is a competent partner for contract manufacturing with ultrashort pulse lasers and offers the precise laser processing of components and tools from prototypes to serial production. Our competencies include laser structuring, laser drilling, laser cutting and functionalisation of surfaces by microstructuring.

**Our offers:**
- Laser microprocessing of components according to your specifications
- Texture design for functional surfaces
- Production from the prototype to the series
- Creation of testing protocols with topographic al measurement
- Qualifications of components according to your specifications

**Laser structuring**

Microstructured surfaces have a high technical and economic potential. The range of applications is wide: functional surfaces, in addition to a change of the wettability or the adhesive properties, can also cause friction and wear minimising effects. Additional to these functions, haptically appealing or optically effective structures are used, for example for light scattering. The use of ultrashort pulse lasers allows a low melting and burr free structuring with high precision, so that no reprocessing is necessary. Depending on the material and the number of components, the structuring takes place either directly on the component or replicatively during a forming process, such as injection moulding.

**Our offers:**
- Microstructuring of metals, glasses, plastics, ceramics, diamond and sapphire
- Minimal structure size: 20 µm lateral, 0.5 µm axial
- Reprocessing free structuring without melting edges, material delay and without thermal damage
- Applications: Tools for micro injection moulding and die stamps, selective ablation of thin films, production of micromcomponents
Functional surfaces

Functional surfaces, surfaces with specifically adapted properties, open up a wide field of component optimisation. Thereby, the most microstructures are copied from the botany or the wildlife. Examples are the wetting changing structures which produce highly water-repellent properties in the lotus plant or friction minimizing structures that allow an improved frictional resistance for sharks. Microstructures in flat frictional contacts such as bearings or axial bearings can specifically change the friction behavior of components. Cup structures on the surface act as lubrication reservoirs or cause a focused pressure build-up similar to hydrodynamic plain bearings. Support structures can effect a transport of lubricants into the area of inadequate lubrication or improve the leakage behavior. Friction and wear can thus be minimized and the lifetime of the component can be increased.

Our offers:
- Reduction of friction and wear on highly stressed components by tribologically effective microstructures
- Modification of the wetting behavior of surfaces by structuring
- Increased light absorbing of metallic surfaces by structuring
- Enlargement of the component surface for increased adhesion
- Individual functionalisation according to your ideas

Laser drilling

Micro drillings are found in a variety of technical products and can be produced by a variety of different procedures. The requirements for the holes and drilling procedures are diverse and include for example high precision in the drilling geometry, the reproducibility and the productivity of the process. With laser beams it is possible to produce holes in the range of micro meters up to a few millimeters with a high reproducibility in almost any material. For this purpose, various laser drilling procedures are available which, depending on the requirements, allow drilling rates of up to several thousand holes per second at high precision with low surface roughness and almost no burr formation.
Laser fine cutting

Classic laser cutting is an established process with a high cutting speed and maximum geometrical freedom for the cutting contour. But a variety of materials can not be processed in this way. The fine cutting with (ultra) short pulsed laser radiation generates the cut with a material removal layer for layer without any thermal influence in the edge regions. This allows fine cutting in brittle-hard, temperature sensitive materials or in thin films. In doing so very high a cutting quality with vertical cutting edges and low roughness is possible.

Our offers:

- Melting free laser fine cutting without material delay
- Sharp-edge cutting of metals, carbides and ceramics
- Contour accuracy: ±5μm, Ra-values: < 5μm
- Material thicknesses: 10-800 μm
- Applications: micromechanics, filter applications, stencil fabrication