



CHARACTERISATION OF SCANNER BASED MANUFACTURING SYSTEMS

Task

Manufacturing processes for laser-based micro material processing rely on a high degree of precision in the positioning of the laser beam. Especially in laser ablation processes, the required contour is repetitively irradiated by the laser beam in order to remove the volume layer by layer. Errors in positioning of the laser beam, however, accumulate through the large number of ablation layers, leading to significant processing errors. Such errors can result from thermal drift of the focusing optics, false positioning of the beam or insufficient calibration of the imaging plane.

Method

To detect system errors, engineers at the Fraunhofer ILT have developed a camera-based measurement system which allows them to identify the relative displacement of the laser beam relative to the work piece. A camera system is coupled coaxially to the optical path of the processing laser and, thus, observes the work piece through the complete beam delivery chain. Algorithms for image processing determine the displacement of the observation position relative to a fixed reference plane. The programmed setting parameters of the beam deflection system are recorded synchronously to allow a comparison with results from the analysis.

Result

The analysis of the programmed path against measured motion yields a description of the dynamic behavior of the complete beam guidance and delivery chain. Based on these results, the engineers at Fraunhofer ILT are able to derive corrective measures for the generation of processing strategies or information for optimization of the overall system performance.

Applications

The system can be used to characterize scanner-based manufacturing systems and allows dynamic properties, such as path and contour precision, to be clearly determined. When the system is combined with a suitable laser source, users will be able to safeguard production relevant properties from the laser source itself to the coupling of the energy into the work piece.

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1 Camera based scanner measuring system.