



NINE-AXIS SIMULTANEOUS PROCESSING

Task

Whenever high speed and dynamics are required for laser materials processing, galvanometer laser scanners – the state-of-the-art – are used to fulfil such demands. On account of their low inertia, these systems are able to guide the laser beam focus over a component surface at several meters per second. To process 3D parts, a conventional mechanical axis system with translational and/or rotatory axes is necessary as well. When both systems are combined, processing large and complex components can be done at high dynamics and great flexibility. In previous approaches, the mechanical axes are used to position the component, which, subsequently, is processed using a laser scanner. Larger or curved surfaces are incrementally processed as several subareas in whose overlapping areas significant visible transitions appear.

Method

The goal here is to process complex 3D geometrical shapes continuously without visible transitions. For this, a conventional five-axis system is combined and synchronized with a three-axis laser scanner so that simultaneous processing with all eight axes is possible without disruptive transitions.

If, in addition, a measuring probe is used, which determines the position and orientation of the component in the machine, a further ninth axis is required, which rotates the scanning field of the laser scanner. The necessity of the further axis results from the non-existent rotation symmetry of the laser scanner as a »tool«.

Result

By integrating the aforementioned measuring probe, Fraunhofer ILT was able to develop a continuous CAM-NC chain. The simultaneous processing can be planned and calculated on a computer using conventional CAM software in combination with an advanced post processor developed at Fraunhofer ILT. The complete CAM-NC chain has already been successfully tested in cooperation with a partner in an industrial application.

Applications

The nine-axis simultaneous processing can be used for surface-based laser processes for which a laser scanner is needed. Among these count laser marking, laser structuring and laser polishing.

Contact

Dipl.-Phys. John Flemmer
Telephone +49 241 8906-137
john.flemmer@ilt.fraunhofer.de

Dr. Edgar Willenborg
Telephone +49 241 8906-213
edgar.willenborg@ilt.fraunhofer.de

1 Component part measured by a measuring probe.

2 CAM planning for laser polishing.