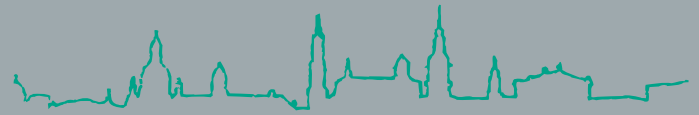




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FRAUNHOFER-INSTITUT FÜR WERKSTOFF- UND STRAHLTECHNIK IWS



HIGH-DYNAMIC FORM CUTTER HDFC₆₀₆₀

Cutting, Welding, Engraving

Fraunhofer Institute for Material and Beam Technology IWS

Winterbergstraße 28, 01277 Dresden
Germany

Fax +49 351 83391-3300
www.iws.fraunhofer.de

Contact:

Dr. Jan Hauptmann
Telefon +49 351 83391-3236
jan.hauptmann@iws.fraunhofer.de

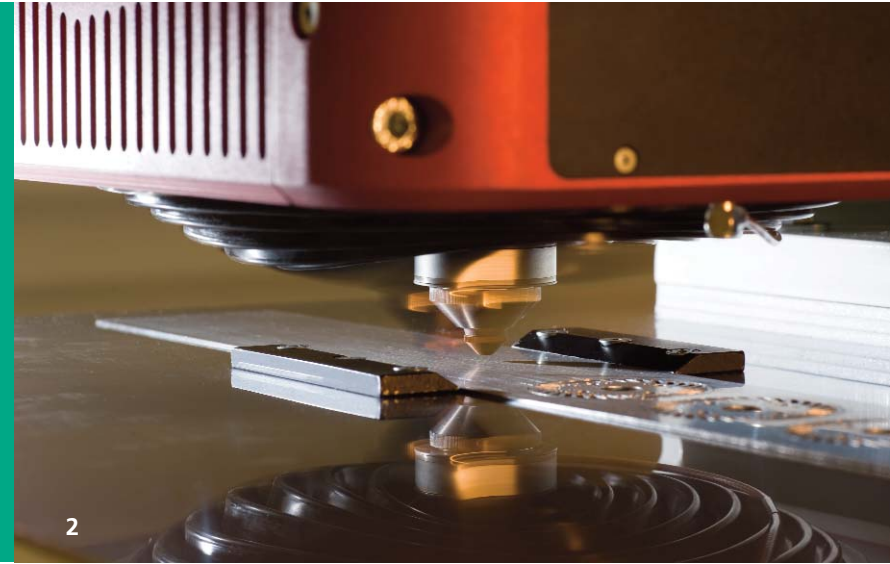
Problem

State-of-the-art laser sources have considerably lifted the limits of cutting speed dependent on material thickness and performance. Innovative solid-state lasers, such as fibre lasers and disc lasers, realise significant higher cutting speeds in comparison to CO₂ lasers at the same output power. However, this potential cannot be transferred into contour cuts by conventional cutting machines, due to dynamic limitations.

Particularly for workpiece geometries with many direction changes, high acceleration and jerk values of the axes are necessary. The jerk describes the temporal increase of acceleration (in m s⁻³). Together with the acceleration, it is the decisive parameter to increase the average processing speed in contour cutting.

Solution

In order to convert the cutting capacity of modern laser sources into contour cutting, an innovative movement concept can be provided with the high-dynamic HDFC₆₀₆₀ form cutter. As a result, current limits of machine dynamics are overcome. With help of a parallel kinematic axle structure, the moving masses for beam and cutting gas movement can be reduced to a considerable degree. Consequently, the dynamic properties in 3 dimensions can be increased significantly. The average processing speed can be doubled on many workpiece geometries or the cutting time can be halved. Seen individually, the HDFC₆₀₆₀ is a fully-fledged machine. It is suitable for the high-productive mass production of complex components in the available working area.



Programming / Control

Through consistent use of standard interfaces, HDFC systems can be directly integrated into existing machine controls. For a stand-alone operation or coupling with different control systems, which do not offer sufficient openness for integration, the flexible programming and control environment RED_{cut} is offered by Fraunhofer IWS.

Contour programming occurs in standard G-code or through a CAM interface. Customer-specific process parameters, which are stored in technology databases, can be allocated to the parts programme. This ensures short set-up times and consistent quality when assignments change.

The PC-based control environment, which works in the background, offers a multitude of different input and output interfaces for communication and synchronisation with superordinate procedures and to control the necessary technical functions (laser, gases, sensors, parts handling, etc.).

Advantages

- application of the cutting capacity of brilliant laser sources for contour cutting
- small heat affected zones, even on corners and radii
- particularly suitable for cutting of heat-sensitive materials
- up to 60 % saving in time for parts with complex component geometries
- compact and cost-effective system for series production
- work field expansion through adjustment operation and superimposed movements with a coupled axis system

- 1 HDFC₆₀₆₀ processing system
- 2 Typical application case for HDFC₆₀₆₀
- 3 Online path planning tool RED_{cut}

Characteristics of the HDFC₆₀₆₀

Work area:	60 x 60 mm ²
Z-axis (stroke):	20 mm
Max. axis speed	1 m s ⁻¹
Max. axis acceleration:	30 m s ⁻²
Positioning precision:	+/- 10 µm
Dimensions:	280 x 250 x 230 mm ³
Weight of entire module:	15 kg
Solid-state laser:	< 5 kW
CO ₂ laser:	< 2.5 kW (on request)
Cutting gas:	N ₂ , O ₂ < 15 bar
Distance sensors:	integrated

