



1 *Microvibe300*
with control unit

MICROVIBE300 SPEED UP YOUR DIE-SINKING EDM

Fraunhofer Institute for Microengineering and Microsystems IMM

Carl-Zeiss-Strasse 18-20
55129 Mainz | Germany

Contact

Stefan Kunz
Phone: +49 6131 990-185
stefan.kunz@imm.fraunhofer.de

www.imm.fraunhofer.de

Introduction

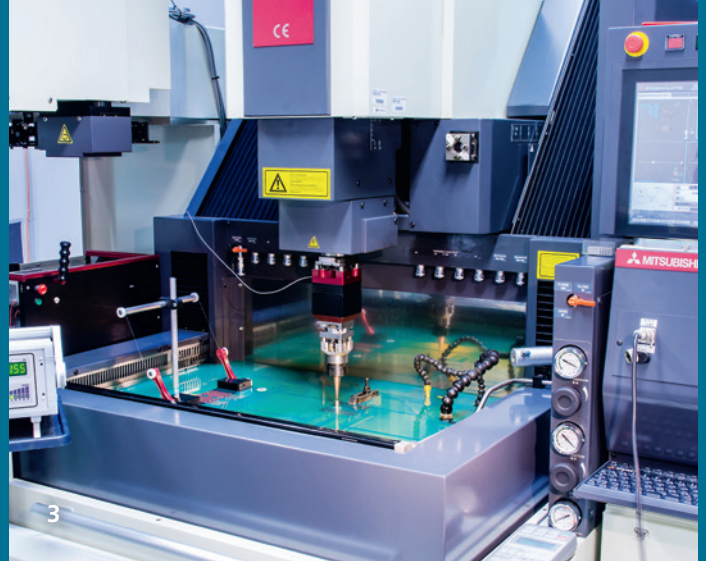
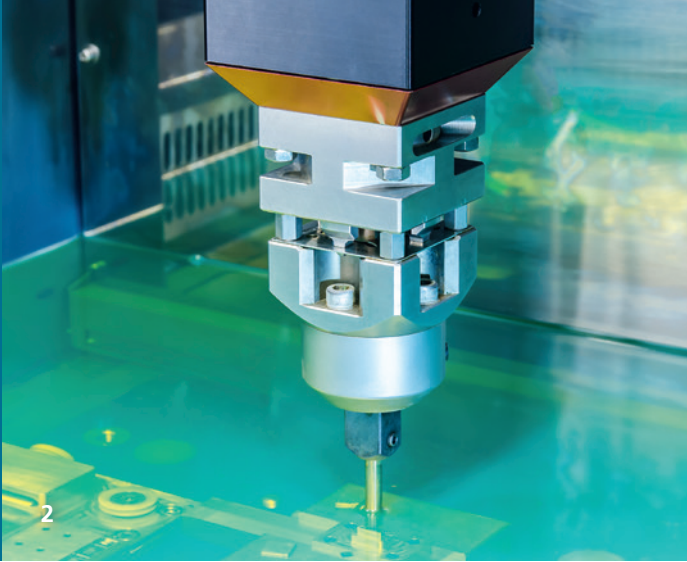
To survive in the global competition and withstand the cost pressure of EDM compared to other machining technologies, it will be fundamental to use any possibility for a cost-saving and economical manufacturing without any quality losses.

To increase the efficiency of precision EDM die-sinking processes, the vibration supported electrode chuck Microvibe300, developed at Fraunhofer IMM, combines a high precision electrode chuck with high frequent vibration in just one unit.

Motivation

A cost-saving manufacturing using die-sinking EDM leads to a higher demand of modern EDM machines and optimized

manufacturing processes. The success of IMM's vibration supported EDM drilling spindle finally leads to the development of a vibration supported device for die-sinking processes. The Microvibe300 vibrating electrode chuck combines the advantages of high precision electrode clamping and a high frequent vibrating EDM sinking process. Especially sinking processes of deep cavities while using electrodes with small front planes can cause problems with the evacuation of already removed material particles out of the active discharge area and ultimately may lead to abnormal termination of the EDM process. Especially the use of small and micro electrodes with high aspect ratios to realize delicate work piece structures, requires the smallest discharge energies, and leads to small discharge gaps and material debris on the micro and nano scale. Common flushing methods are not effective in this work environment and new solutions are necessary.



Numerous tests pointed out that high frequent vibrations on the electrode in z-axis direction causes current flows in the discharge gap, so material debris can be washed away. This finally leads to a consistent EDM process, whereby machining time will be reduced significantly by partly less electrode wear. Microvibe300 is not restricted to micro machining and can be successfully used for sinking processes with discharge currents up to 30 A and electrode weights up to 0.7 kg (incl. holder).

Integration into an existing machine system

The Microvibe300 device is designed as an add-on device and fits to any commercial EDM die-sinking machine by using the installed clamping system (machine side). The Microvibe300 unit can be equipped with

any commercially available fixuring system. Custom designed connections to machines for special applications can also be realized. To hold the electrodes, any available electrode fixuring system can be connected to the Microvibe (workpiece side). Electrodes can also be mounted directly on the Microvibe front face without a clamping system. Due to the included and self-sufficient controller, no intervention to the existing machine controller is required, so we can thoroughly entitle the Microvibe300 system as a plug and play unit.

Target group

The current version of the Microvibe300 system is primarily designed for all sinking processes without rotation using electrodes up to 0.7 kg weight and a discharge current of max. 30 A.

Application areas

Microvibe300 will provide the most benefit for processes with:

- poor flushing conditions
- small front plane electrodes
- high aspect ratio (front surface/depths)
- micro electrodes

The use of Microvibe300 can reduce machining time up to 50 % without losses in machining quality and without any negative changes to the electrode wear.

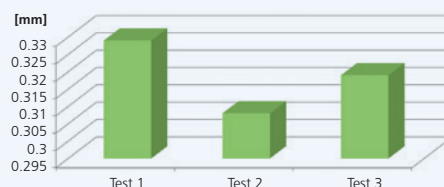
- 2 *Microvibe300 in process*
- 3 *Microvibe300 installed on a Mitsubishi EA12*

Multi-cavity sinking process

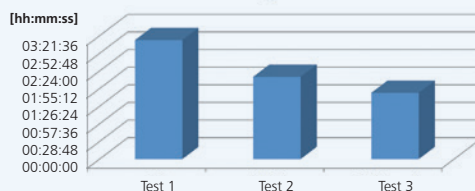
- Rib electrode (5 ribs)
- 3 ribs: 0.5 mm x 3 mm, 2 ribs: 0.5 mm x 2 mm
- Electrode WCu
- Material 1.4305
- Sinking depth 12 mm

Test 1: regular sinking process
 Test 2: vibration only
 Test 3: partly jump with vibration

Front wear



Machining time



Rib electrode

