

VIBRATION TABLE FOR HYBRID MACHINING

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This new 2D-actuator enables ultrasonic assisted drilling, milling or grinding of brittle-hard materials like ceramic, glass, silicium carbides or hardened steel. It can be used in combination with existing machining centres. Operating at low frequency it allows the compensation of thermal and geometric faults at the workpiece as well.

BACKGROUND

Brittle-hard materials are increasingly used to realise small-sized structures with high surface quality in the area of precision engineering, for production of medical devices or tool design and construction. Common hybrid machining processes use ultrasonic vibration of the machining tool to improve the machining of these materials. To achieve these improvements the processes are restricted to the application of the resonance frequency of the tool. The economically optimised use of the process is also limited due to the restriction on uniaxial resonance vibrations. In contrast thereto an adjustable vibration direction would result in an increase of the material removal rate. This shows the necessity of a multi-axis-activation.

TECHNOLOGY

The new vibration table vibrates the workpiece itself in up to three directions. This allows multi-axis hybrid machining with low vibration frequency (1 Hz up to 1 kHz). To reduce friction a coupling via air bearings is used in the platform. Activation with piezo-actuators and an integrated balance mass enables to adjust frequency and amplitude. In combination with an active control via vibration sensors user-defined combinations of vibration modes are possible.

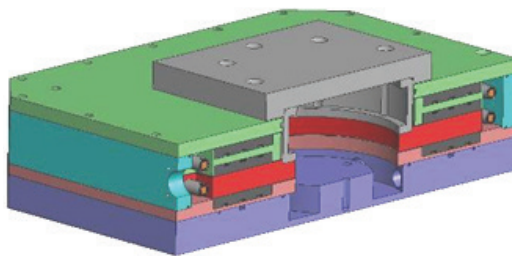


Fig 1: Design concept of the vibration table

ADVANTAGES

- Increase of material removal rate
- Significant increase of tool life with ultrasonic vibration
- Stroke X/Y up to 30µm
- Improvements in chip flushing
- Applicable to all common machining centres via conventional mounting systems



Fig 2: Prototype

REFERENCE:
M060-10

APPLICATIONS:

- Adaptive and hybride machining of brittle-hard materials
- Support for helical and trochoid machining

KEYWORDS:

hybrid machining, ultrasonic assisted grinding, positioning facility, vibration table

DEVELOPMENT STATUS:

Prototype suitable for industrial use, experimental tests with quartz glass, Al₂O₃, ZrO and SiSiC.

IPR:

Patents AT511551, EP2709796, US 346139 and CN ZL201280023898.3 granted

OPTIONS:

- R&D cooperation
- License agreement

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