Benefits of piezoelectric actuator integration

- Increases productivity by enhancing machine tool functionality
- Improves surface quality by compensating for structural machine vibration
- Enhances workpiece and tool positioning accuracy with a repeating accuracy in the submicron range
- Increases material removal rate

Our services

- Computer-aided dimensioning of mechanical components for the integration of piezoelectric actuating elements into machine tools
- Simulative design and implementation of simple and model-based regulators for the activation of piezoelectric axes
- Selection of adequate control hardware for piezoelectric components and configuration of the interface with the superior machine control system

Our skills

- High level of expertise in the field of construction and control-system design for the dimensioning and system integration of piezoelectric actuating elements
- Many years of experience in the development of piezoelectric systems for UP-turning with fast tool servos, the active boring of noncircular barrel bushes and the ultrasonic-assisted grinding process
- Transferability of our solutions to a multitude of further engineering applications

PIEZOELECTRIC ACTUATING ELEMENTS IN PRODUCTION

The integration of piezoelectric actuating elements into machine tools enables the structural integration of oscillation compensation in machine components in order to increase the surface quality of the workpieces significantly.

In the field of precision and ultra-precision technology, the manufacturing of freeform surfaces is gaining in importance. Fast tool servo systems (FTS) with piezoelectric actuation allow for high-precision manufacturing of non-rotation-symmetrical target geometries in the turning process. Furthermore, we also develop system solutions for piezoelectric-assisted ultra-precise workpiece alignment for ultra-precise milling.

The superposition of the conventional grinding processes with a piezoelectric-generated ultrasonic vibration leads to a significant increase in the removal rate. Furthermore, the systematic discharging of vibration yields improved efficiency in the turning, honing and lapping processes.
MECHANICAL INTEGRATION AND DIMENSIONING

Our services

• Structural integration of piezoelectric axes with sensor technology and mechanical guides into existing systems
• Dimensioning of rigid body joints for the guiding of rigidity- and mass-optimized piezoelectric infeed motion based on CAD and FEA
• Development and qualification of ultrasonic-assisted spindle and machine systems
• Specific design of ultrasonic-assisted tools and components to improve conventional process efficiency
• Simulation and dimensioning of oscillation systems

Our skills

• Extensive design library of rigid body joint kinematics
• Extensive expertise in design and implementation of components and systems for piezo-assisted hybrid processes
• Process technology analysis and system optimization from one source
Our services

- Complete simulation of the static, kinematic and dynamic response characteristics of piezoelectric-based actuation systems
- Fast and precise realization of PID controller algorithms
- Complete simulation library for guides, piezoelectric actuators and power electronics for the implementation of adaptive model-based control systems
- Dimensioning and configuration of piezoelectric activating controllers with respect to command variable and disturbance variable characteristics
- Tailored implementation of robust control concepts for different machining functionalities

Our skills

- Model-based synthesis of control loops
- Mathematical and physical simulation of piezoelectric actuating systems in state control models
- Dimensioning of optimized controllers for active vibration compensation and high dynamic infeed motion according to command geometries
**CUSTOM CONTROL SOLUTIONS**

**Our services**

- Development and dimensioning of piezoelectric-actuated control concepts in compact and autarkic devices according to customer demands
- Offline engineering for planning and dimensioning of the control topology (hardware-in-the-loop simulation)
- Use of graphically configurable modular control systems
- Configuration of the interface with the superior machine control system (master-slave integration)
- Programming and implementation of real-time-capable, robust and industrially-tested control systems

**Our skills**

- Best possible adjustment to the equipment of different producers
- Highly modular concepts create redundancies and thus more efficient and targeted performance of new tasks
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