The development of machine tools for high-precision and ultra-precision manufacturing demands a broad range of knowledge and experience. Over the years we have built up the requisite expertise and are able to apply it to the benefit of your project.

Benefits of machine development at the Fraunhofer IPT

- Realization of sophisticated machine specifications for the application of all required process parameters
- Achievement of highest geometry, positioning and working accuracies
- Enhancement of the overall machine tool performance
- Turn-key automation solutions for workpiece assembly and alignment as well as tool changing within submicron accuracy

Our services

- Systematic machine conception and evaluation to ensure the degree of freedom required for optimizing axis configurations
- 3D detailing of the machine systems and derivation of 2D manufacturing drawings
- FEA-based modeling and dimensioning of critical elements within the force flux in order to optimize static, dynamic and thermal machine behavior
- Conception, planning and implementation of the electrical system, from the control cabinet to drive control configuration
- Assembly and initial start-up of complex mechatronic systems
- Assembly, mechanical integration and control implementation of additional machine system components

Our skills

- We are experts in the development and optimization of precision and ultra-precision machine tools for industrial applications
- With our interdisciplinary team, we can offer customized system solutions that take into consideration both the mechanical force flux and the drive control unit
- We identify your sensitive machine specifications (sensitivity analysis) and systematically optimize the working accuracy of your machine systems
- Computer-aided design of bearing and drive systems along with the entire control unit allows us to guarantee the highest performance for your machine tool
The geometric and working accuracy of a machine tool depends to a great degree on the feed accuracy and stiffness of the bearings and linear guides. When dimensioning fluidic bearings, not only the stiffness of the fluidic gap has to be taken into account, but also the structural stiffness of the mechanical systems.

**Benefits of fluidic bearing dimensioning and design**

- Consideration of the fluidic as well as the mechanical properties of the bearing system
- Realization of highest possible geometry and working accuracies
- Elimination of stick-slip effects, thus ensuring highest positioning accuracy
- Highest possible bearing stiffness and damping properties achievable

**Our services**

- Precise adaptation of aerostatic and hydrostatic bearing systems to the requirements of your machine systems
- Computer-aided dimensioning of aerostatic and hydrostatic bearing and linear guidance systems under consideration of fluid kinematics
- Comprehensive consideration of mechanical and thermal load deformation behavior of all bearing elements in the force flux
- Derivation of manufacturing tolerances under consideration of the overall tolerance chain in the force flux

**Our skills**

- With our theoretically-grounded, industrially-tested design tools, you will be able to achieve highest geometric accuracy
- We are able to calculate the resulting load deformation behavior of your bearing system precisely, which can be taken into account within your machine error budget
- We not only design your aerostatic or hydrostatic bearing system, but also advise you concerning all related critical design areas
- We therefore help ensure that you achieve your development objectives
CUSTOMIZED DRIVE TECHNIQUE

The performance of a machine tool influences the profitability of your application significantly. Adapting the drive and control systems to your requirements enables you to achieve ultra-precise accuracy in a cost-efficient manner.

Benefits of our integrated, adapted drive systems

- Very high axis dynamics despite high positioning accuracy
- Realization of process requirements that cannot be covered by conventional drives
- Minimization of error sources through selective initiation of drive loads
- Reduction of compliances and error sources in the drive control unit

Our services

- Conception, dimensioning and initial start-up of high dynamic or customized drive systems
- Design of piezoelectric actuator systems for the development of active additional axes
- Design and control implementation of autarkic feed axis
- Conception, model-based control design and initial start-up of complex, high dynamic axis systems

Our skills

- We develop special-purpose solutions for industrial use that allow you to realize your high dynamic drive unit even within a complex control system
- Due to our extensive interdisciplinary experience, we are able to take into account the entire mechatronic system in our holistic design and dimensioning processes
- You profit from our experience: with our customized solutions, your specialized application becomes feasible or more efficient
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