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High Performance Motion Control – Systems Approach Provides Nanometer Precision for Industrial Applications

High performance motion control plays a key part in positioning and handling applications, such as semiconductor manufacturing, laser and materials processing, optical inspection systems, additive manufacturing or industrial digital printing. In addition to providing reliability and robustness, deterministic behavior with minimized latency, high-speed synchronization with external devices, such as lasers and cameras, is required to achieve sub-micrometer path accuracy, exact positioning repeatability, high dynamics, and throughput. Safety, ease of operation, and state-of-the-art connectivity for integration into industrial network environments are further requirements.

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The higher the dynamics and throughput targets of a multi-axis precision motion system, the more holistic the design approach that has to be taken to achieve success. The best positioning mechanics cannot follow multi-dimensional motion profiles without an industry grade motion controller that will synchronize the individual axes on a sub-millisecond time scale, while at the same time communicating with a higher-level automation environment. A systems approach where mechanics, control electronics, and software are designed by the same team provides obvious advantages for the user.

Customized Complete Systems from One Single Source
When ACS Motion Control joined the PI Group, this was one of the goals. Based on 30+ years of design experience with industrial precision automation, the latest generation of modular controllers from ACS now provides the motion control brain power for PI's engineered motion systems for industrial applications with the highest demands on precision and dynamics. Over the last 4 decades, PI's precision positioning systems have enabled countless high-end applications in industries from semiconductor manufacturing to biotechnology.

100,000:1 Dynamic Range, EtherCAT, Extensive Trigger Functionality
ACS motion controllers are modular by design, interchangeable, scalable, and communicate with various Ethernet protocols. They are also EtherCAT masters, responsible for managing all the network nodes (drives, I/Os, sensors) of the EtherCAT network. The servo loop is handled inside each universal drive module for

10-axis precision motion system for touch point testing includes voice-coil actuator with highly sensitive force feedback. (Image: PI) [Watch video.](#)

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