

PI—History of Innovation

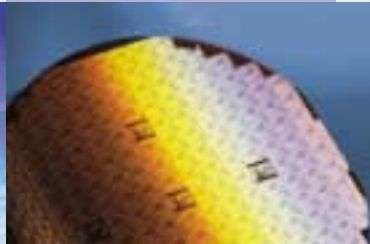
The following examples emphasize PI's four decades of innovation in micro- and nanopositioning technology

70's



- First commercially available piezo translators
- First PZT translators with integrated preload for industrial reliability

80's



- First commercially available closed-loop piezo actuators
- First flexure-guided piezo-driven nanopositioning systems
- First hybrid multiaxis fiber alignment systems
- First preloaded actuators with monolithic low-voltage PZTs
- Nanopositioning systems with PC interface
- First closed-loop, image stabilization platforms

90's



- First flexure-guided, high-speed nano-focus device
- First two-plate capacitive sensors / controllers w/ integrated linearization for sub-nanometer precision
- First parallel kinematics multiaxis piezo nanopositioning stage with integrated parallel metrology
- First piezoelectrically driven high-speed tool servo
- PI becomes the first nanopositioning systems supplier with piezo-ceramics-manufacturing capabilities
- First sub-micron 6-DOF Hexapod
- First fully automated fiber alignment system with high-resolution Piezo-Walk™ drive (10 nm)
- First piezo stage with 6D active trajectory control
- First fully automated 6-DOF photonics alignment system with virtual pivot point
- First piezo controller with InputShaping® vibration elimination algorithms

2000–



- Patented high-force compact piezomotors
- First 6-axis digital piezo controller
- First piezo controller with dynamic linearization (improves dynamic linearity by up to 3 orders of magnitude)
- First closed-loop piezo-driven steering mirror with 50 mrad range
- First PICMA® monolithic piezo actuators w/ ceramic insulation for increased lifetime and zero outgassing
- Fastest open-frame, closed-loop XY nanopositioning stage
- Lowest out-of-plane motion nanopositioning stages (< 1 nm)

With over four decades experience, PI has evolved into the world-leading supplier of nanopositioning technology.

In the **70's**, when space exploration spurred new research in optics, PI introduced piezo actuators to help scientists control motion to sub-micron levels.

In the **80's**, when the introduction of microcomputers created the first semiconductor boom and the need for smaller and smaller feature sizes, PI nanopositioning systems were ready to take on the challenge.

The fall of the Berlin wall in the **90's** marked the end of the cold war and the beginning of a new age of borderless communications. It also meant the beginning of a new age for PI: the start of the piezoceramic division PI Ceramic.

The new **millennium** saw worldwide efforts advancing fiber-optic technologies, nanotechnology and biotechnology, fields where "smaller" and "more precise" is the key to success. PI is there to lead the way with faster and higher-performance motion control systems.

Nanopositioning, Nanomechanics Leadership

PI has been developing and manufacturing products in the field of nanomechanics and nanotechnology for more than 30 years. During this time, we have achieved and continually consolidated our position as a global market leader. Prime examples of our core competencies and cutting-edge technology are to be found in the development of parallel kinematics—integrated 6-axis positioners based on the Hexapod—and in the field of nanopositioning with piezoceramic actuators.

PI employs more than 300 staff worldwide and maintains sales, support and service offices in Germany, the USA, England, France, Italy, Japan and China with nanometrology capabilities on three continents. PI is represented in many countries around the world.

At the Heart of our Systems: the Piezo Effect

One small step for Pierre Curie—one great leap for the world. The piezo effect—Pierre Curie's discovery of about a hundred years ago—now forms the basis of the smallest mechanical, electronic or control-technology products. When voltage is applied to piezoelectric crystals or ceramics, they expand. We exploit this effect to create positioning systems with nanometer accuracy.

PI Products— Innovation & Superior Quality

PI has been ISO 9001 certified since 1994. Our products are characterized by their quality and innovation. Developed to give the highest degree of precision, we employ the most-modern tools and software for product development like FEM calculations and simulations. To determine the performance level of our products, we had to design equipment capable of resolving to fractions of a nanometer, pushing measurement accuracies to the limit.

Precision Advances

Over the years we have seen many technological advances make the transition from the laboratory to daily life, advances requiring the utmost in positioning accuracy, advances inconceivable without PI. Finer and finer structures on semiconductor wafers for cost-effective mass-production of high-performance electronics, or higher and higher density in telecommunications streams with millisecond switching from network to network, all in the minimum amount of space: this is where PI is at home.

PI's Customers

PI customers come from all sectors of manufacturing, quality assurance, research and development. And they are spread across many branches of industry:

- Astronomy
- Semiconductors
- Semiconductor Test Systems
- Medical Engineering
- Bio- / Nanotechnology
- Telecommunications
- Precision Engineering
- Aerospace Engineering

PI's customers even include national standardization institutes.

As our customer, you also profit from our more than 30 years' experience in micro- and nanopositioning technology. You will join an ever-increasing number of renowned companies and institutes whose products are at the cutting edge of innovation, research and technology. PI moves the nanoworld.

PI USA. The east coast office in Auburn, MA, also hosts a service department with nano metrology equipment.



PI Headquarters, Karlsruhe, Germany. PI employs the world's most experienced design and manufacturing teams for nanopositioning and nanomechanics products.

