



M-810 6-Axis Positioner

High Performance and Load Capacity in a Small Space

Preliminary Data



The compact M-810 is smaller in diameter than a CD, but offers long travel ranges in six axes with excellent position resolution

The new M-810 miniature Hexapod combines all advantages of proven parallel-kinematic systems in the smallest of packages. With a diameter of only 100 mm and a height of 118 mm, the M-810 offers travel ranges of up to 40 mm in the XY plane and 13 mm in the Z-direction. Special high-resolution magnetic encoders and high-performance brushless motors contribute to the excellent actual resolution of <math><100\text{ nm}</math>.

Despite of its small size, the hexapod can reliably position loads of up to 5 kg at velocities of 10 mm/s. The limited space necessitated the usage of new technologies for encoders, motors and limit switches. Nevertheless, control is 100 % compatible to previous standard PI Hexapods. As with other parallel-kinematic positioners from PI, the six high-resolution actuators are

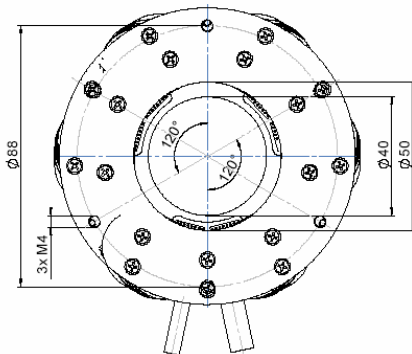
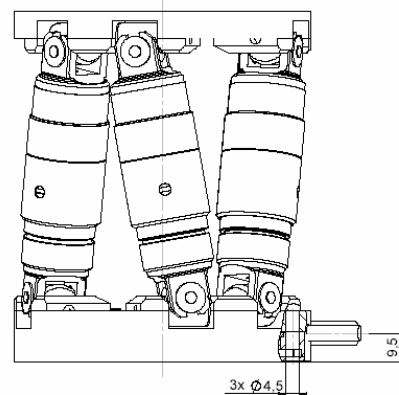
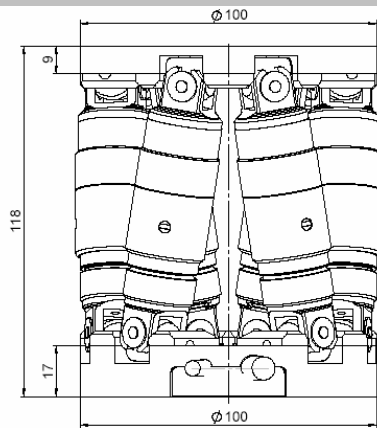
connected directly to a single moving platform. The user is able to define the center of rotation (pivot point) independent of platform motion with a simple software command. In contrast to conventional, stacked, multi-axis systems, there is no accumulation of guiding and lever-arm errors.

Application Examples

- Optics alignment
- Automation
- Quality assurance testing
- Testing equipment

Preliminary Data: M-810

- D= 100mm
- H= 118mm
- max Load= 5kg
- max Vel = 10mm/s
- Travel X,Y +/-20mm
- Travel Z +/-6.5mm
- Travel U,V +/-11deg
- Travel W +/- 30deg



Hexapod Controller with optional built-in display and keyboard.

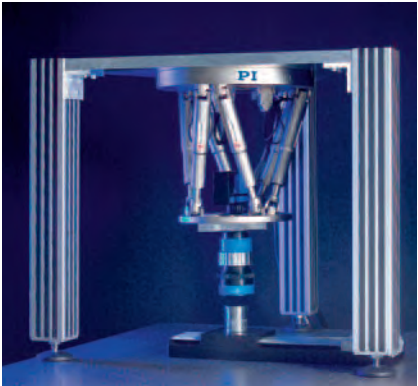
M-810

Preliminary Data

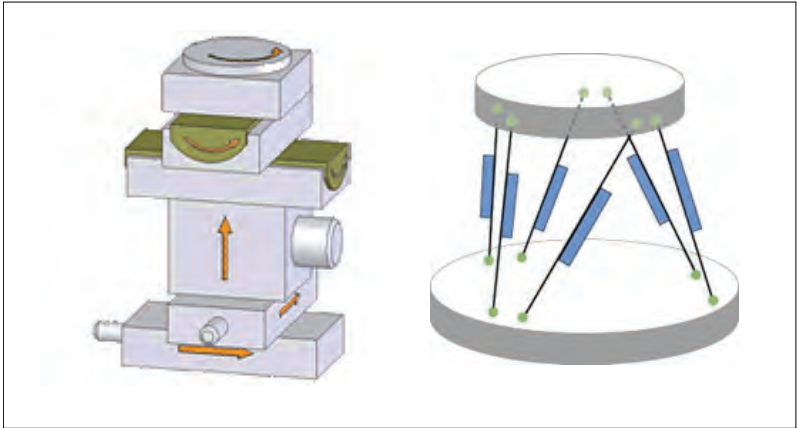
Parallel Kinematics Positioning Systems

Controlling Motion in up to 6 Axes with Sub-Micron Precision

PI is the leading manufacturer of Hexapod micro- and nanopositioning systems. In addition to these parallel kinematics devices, PI offers a wide selection of innovative precision positioning systems for science and industry. PI's products range from piezoceramic linear motors to actuators to translation and multi-axis stages and include systems with integrated controllers.



PI Hexapod in an optics testing application. The parallel kinematic design and large aperture allow for the interferometer to be integrated into the Hexapod. Images are captured by a CCD camera and evaluated in real time. A MATLAB program, controls the position of the Hexapod. (Photo: PI / Fraunhofer Institute for Production Technology, IPT)



Stacked serial kinematics 6D system vs. Hexapod parallel kinematics system designs. Advantages such as compactness and minimized inertia (one platform for all sixactuators) are easily seen. The reduced inertial mass makes for significantly faster response than with serial kinematics. Because there are no moving cables to cause friction, repeatability is increased also.

Advantages of PKM

- Lower Inertia
- Better Dynamic Behavior
- Smaller Package Size
- Higher Stiffness
- No Accumulation of Position Errors
- Reduced Runout Errors
- No Moving Cables: Better Repeatability

PI's Electro-Mechanical Hexapod Spectrum



Variety of Hexapod parallel kinematics micropositioning systems.



Large custom Hexapod with a positioning frame measuring some 1.0 x 1.5 meters.

PI: Hexapod / Tripod Systems Experience

Shown here are but a few custom hexapods and tripods developed by PI in recent years.

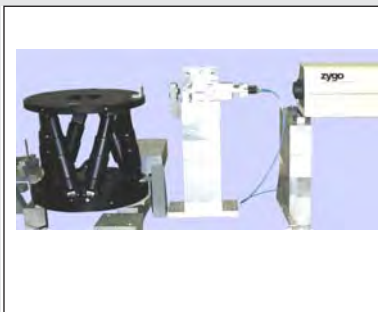
These systems were designed for special customer applications and are not available off the shelf; many other custom systems are subject to non-disclosure agreements and cannot be shown at all.



Custom, high-precision, non-magnetic Hexapod with the award-winning piezo-based NEXLINE® nano drives.



Custom Hexapod with additional struts providing independent position feedback for additional security.



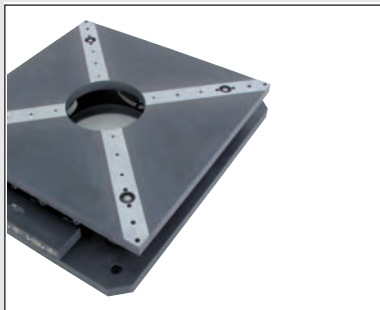
Tzec Maun Telescope Hexapod Secondary Alignment System. Travel XY: 4 mm, Z: 24 mm; Tip/Tilt 2°; <1µm Resolution; 30 kg Load capacity



Custom Hexapod & piezo tip/tilt system for alignment of secondary mirrors in astronomical telescopes.



Custom Hexapod for automatic satellite antenna alignment.



Tripod: XY rot-Z stage. Parallel Kinematics 160 mm Aperture, 1500 N load capacity



Custom Hexapod with active tip/tilt mirror for the UKIRT infrared telescope on Mauna Kea, Hawaii



1000kg-Class Hexapod Alignment System (Ø1m) Compared to 100kg-Class Hexapod (Ø0.3m)



PiezoWalk® Tripod: Z/Tip/Tilt Stage Ø300 mm, 200 N load capacity, 1.3 mm piston, 10 mrad tilt range



Custom high-load, moisture-protected Hexapod for Astronomy applications



M-810, Miniature Hexapod Ø=100mm, H=118mm, max Load= 5kg, X,Y: +/-20mm, Z: +/-6.5mm, rot U,V +/-11°, rot W +/- 30°

