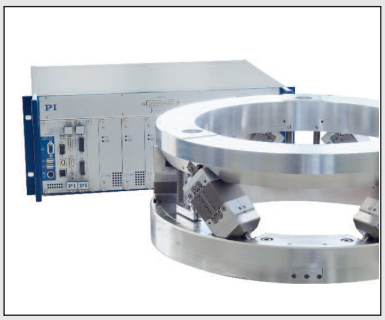
Special Hexapods / Stewart Platforms

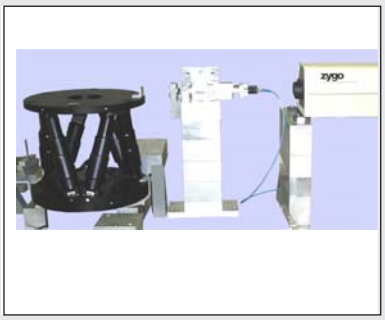
Shown here are but a few custom hexapods and tripods developed by PI in recent years.

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 piezo hexapod with controller

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.

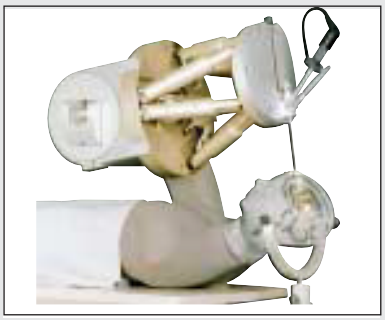
Custom Hexapod for automatic satellite antenna alignment.

Custom miniature piezo hexapod

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)

Custom Hexapod for alignment of secondary mirrors.



Custom Hexapod for brain surgery. Photo courtesy of IPA.

Custom "6+3" Hexapod with additional struts providing independent position feedback. Translation stage for extended Z-travel.

M-850K Vacuum Hexapod 6-Axis Positioner

Parallel-Kinematics System for Wide Temperature Ranges

- 6 Degrees of Freedom, Works in Any Orientation
- Vacuum Compatible up to 10^{-6} hPa
- 200 kg Load Capacity (Vertical)
- Repeatability to ±1 µm
- Encoder Resolution to 5 nm

Model	Operating temperature range	Storage temperature	Travel ranges	Dimensions
M-850KTVH Vacuum Hexapod	-10 bis +25 °C	-20 bis +40 °C	±50 mm (X,Y), ±25 mm (Z) ±15° (θ_X, θ_Y), ±30° (θ_Z)	Ø 350 mm 330 mm height

This custom hexapod was designed to work in a thermo-vacuum chamber

M-850K Weatherproof Hexapod

Ultra-High-Precision Hexapod for Outdoor Operation

- Load Capacity to 750 N
- Unidirectional Repeatability to 5 µm
- Clear Aperture Ø 420 mm
- Long Lifetime: 2 Million Cycles
- Drive: Brushless Motors
- Correspond to protection class IP 64
- Corrosion Protection

Model	Travel Range X / Y / Z	Max. load capacity	Mass	Dimensions
M-850KWAH Weatherproof Hexapod	±10 / ±11 / ±16 mm	750 N	46 kg	Outer Ø 580 mm height 357 mm

This customer-specific M-850KWAH Hexapod can operate outdoors at altitudes up to 5000 m

N-515K Non-Magnetic Piezo Hexapod

6-Axis Precision Positioning System with NEXLINE® Linear Drives

6-axis parallel kinematics (Hexapod) with integrated N-215 NEXLINE® high-load actuators, suitable for applications in strong magnetic fields

- Travel Ranges 10 mm Linear, 6° Rotation
- Large Clear Aperture Ø 202 mm
- Non-Magnetic
- Nanometer Resolution
- Low-Profile: 140 mm Height Only
- Parallel Kinematics for Enhanced Dynamics and Better Multi-Axis Accuracy
- Up to 500 N Force Generation
- Self Locking at Rest, No Heat Generation

Model	Travel range	Load capacity	Dimensions
N-515KNPH NEXLINE® Piezo Hexapod	X, Y, Z: 10 mm θ_X, θ_Y, θ_Z: 6°	50 kg	Outer Ø baseplate, 380 mm Ø moved platform (top) 300 mm 140 mm height

M-850K Ultra-High-Load Hexapod

Precise Hexapod for Ultra-High Loads up to 1 Ton

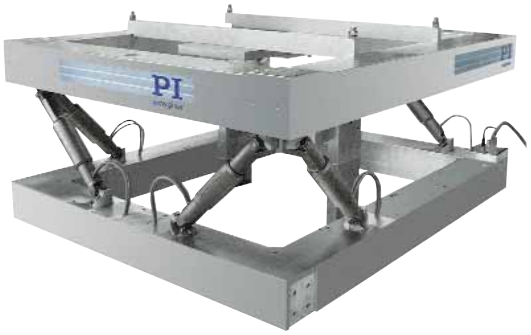
- **Six Degrees of Freedom**
- **Max. Load Capacity to 1000 kg**
- **Repeatability to 2 µm**
- **Drive: Brushless Motors with Brake**
- **Vacuum Compatible up to 10^{-6} hPa**

Model	Travel range X / Y / Z	Rotation range θ_x / θ_y / θ_z	Max. velocity X/Y/Z	Dimensions
M-850KHLH	±12 mm	±3° / ±3° / ±4°	0.5 mm/s	Ø outside 1 m height 0.5 m

The vaccum compatible Hexapod M-850KHLH provides six degrees of freedom for loads up to 1 t, here with a standard M-840 hexapod for size comparison

M-850K Large-Aperture High-Load Hexapod

6-Axis Precision Positioning & Alignment System for Inspection Systems



Dimensions of 100 x 84 x 40 cm and a load capacity of up to 200 kg makes this custom Hexapod system suitable for all kinds of fine-positioning tasks, as in TV-screen inspection

- **200 kg Load Capacity (Vertical)**
- **Very Large Aperture (640 x 820 mm)**
- **Six Degrees of Freedom**
- **No Moving Cables for Improved Reliability and Precision**
- **Parallel-Kinematics Design—Significantly Smaller and Stiffer than Serial-Kinematics Systems, Better Dynamics**
- **Virtual Pivot Point**
- **Sophisticated Controller Using Vector Algorithms Included**

Model	Max. load base-plate horizontal optional)	Travel range X / Z / Z	Travel range θ_x / θ_y / θ_z	Typ. velocity	Dimensions
M-850KLAH Large Hexapod	200 / 50 kg	±25 mm	±5°	2 mm/s lin. 25 mrad/s rot.	100 x 84 x 40 cm

M-850K Ultra-High Load Hexapod

6-Axes, Long Travel, Micron Precision, 1 Ton in Any Orientation

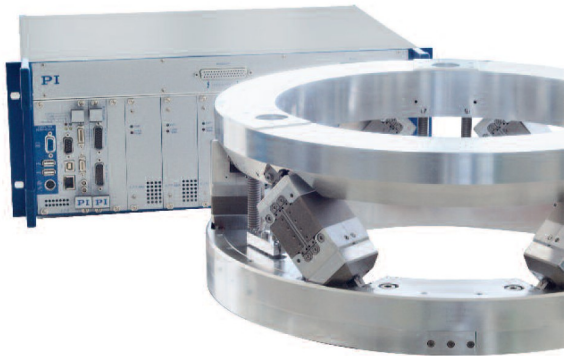
- **Load Capacity to 1000 kg in Any Orientation**
- **Six Degrees of Freedom**
- **Travel Ranges to ±200 mm, to ±20°**
- **Resolution to 0.8 µm, to 0.5 µrad**
- **Drive: Brushless Motors with Brake**
- **Sophisticated Controller Using Vector Algorithms**

Model	Travel ranges	Push/ pull force	Max. velocity	Unidirectional Repeatability	Dimensions
M-850KHTH High-Load Hexapod with Long Travel Range	±200 mm (X, Y), ±100 mm (Z) ±20° (θ_X, θ_Y), ±5° (θ_Z)	10,000 N	1 mm/s	±1 µm; ±3 µrad	Baseplate: 900 mm Ø Upper platform: 800 mm Ø height 714 mm aperture: Ø 500 mm

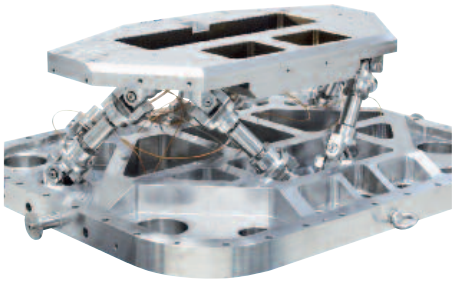
This custom parallel-kinematics system positions loads up to one ton in any orientation with micron accuracy

PI's Electro-Mechanical Hexapod Spectrum

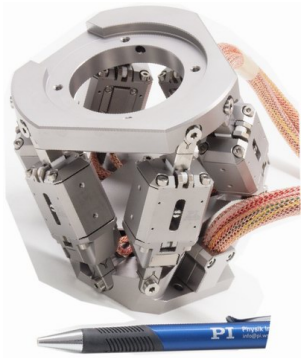
M-811 Miniature Vacuum Hexapod



Custom piezo hexapod with controller

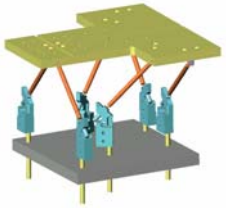


Custom Vacuum Hexapod



Custom miniature piezo hexapod

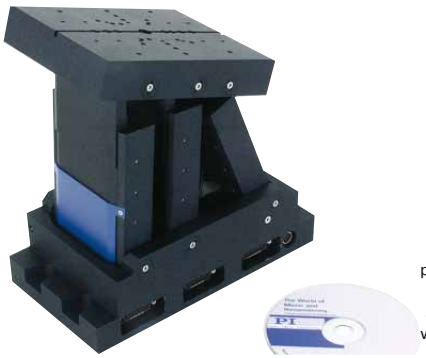
F-206 Hexapod alignment system at a workstation for automated pigtailing of fiber optic devices. Printed with permission from Aries Innovations.



Flexure Hexapod Design

Parallel Kinematic Tripod / Goniometer

Precision Positioning in X, Z, θ_Y



The parallel-kinematics tripod is designed for precision positioning, offering elevation, translation and tilt motion around the (horizontal) y-axis, with a user-defined pivot point

- **Goniometer Z Stage with Freely Selectable Pivot Point**
- **Travel Ranges ±25 mm / ±25 mm / ±30°**
- **Load Capacity to 4 kg**
- **Min. Incremental Motion to 0.1 µm**
- **ActiveDrive Servo Motors**
- **Compact Design with Parallel Kinematics**

Model	Travel ranges	Max. velocity	Stiffness	Dimensions
Tripod Goniometer-Stage	±25 mm (X, Z), ±30° (θ_Y)	10 mm/s (linear)	50 N/µm	223,2 x 110 x 192 mm

M-880 3-Axis Planar Precision Positioning System

XY-Rot-Z Parallel Kinematics System with Very High Holding Force

M-880.PD for planar load positioning up to 20 kg with sub-micron accuracy

- **Travel Ranges 20 x 20 mm / 8°**
- **Static Load Capacity to 150 kg**
- **ActiveDrive Servo Motors**
- **Low Profile through Parallel Kinematics**
- **Min. Incremental Motion to 0.75 µm**
- **Large Clear Aperture**
- **Sophisticated Controller Included**

Model	Active Axes	Travel range	Max. velocity	Stiffness (linear axes)	Dynamic load capacity	Static load capacity
M-880.PD	X, Y, θ_Z	±10 mm, ±4°	20 mm/s	5 N/µm	200 N	1500 N

Program Overview

- Piezo Ceramic Actuators & Motors
- Piezo Nanopositioning Systems and Scanners
- Active Optics / Tip-Tilt Platforms
- Capacitive Nanometrology Sensors
- Piezo Electronics: Amplifiers and Controllers
- Hexapod 6-Axis Positioners / Robots
- Micropositioning Stages & Actuators
- Photonics Alignment Systems, Solutions for Telecommunications
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- Ultrasonic Linear Motors

Request or download the complete PI Nanopositioning & Piezo Actuator Catalog

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