Piezo • Nano • Positioning

M-810 Miniature Hexapod

6 Degrees of Freedom & High Precision in a Small Package

The miniature Hexapod M-810 provides long travel ranges despite its compact design

- **Most-Compact Hexapod in the PI Portfolio**
- **Travel Ranges 40 x 40 x 13 mm, Rotation to 60 Degrees**
- **Load Capacity to 5 kg**
- **Resolution of a Single Strut 40 nm**
- **Min. Incremental Motion to 200 nm**
- **Repeatability up to ±0.5 µm**
- **Velocity to 10 mm/s**

With a platform diameter of only 10 cm the M-810 Hexapod is the most compact parallel-kinematics micropositioning system to date. In addition to positioning all six axes with high speed and accuracy, it allows the user to define the center of rotation (pivot point) anywhere inside or outside the system envelope by one simple software command. This makes it ideal for all complex positioning tasks with restricted space.

Application Examples

- Biotechnology
- Semiconductor technology
- Micromachining
- Micromanipulation
- X-ray diffraction measurements
- Tool control

Ordering Information

M-810.00
Miniature-Hexapod Microrobot with Controller, Direct Drive

Ask about custom designs

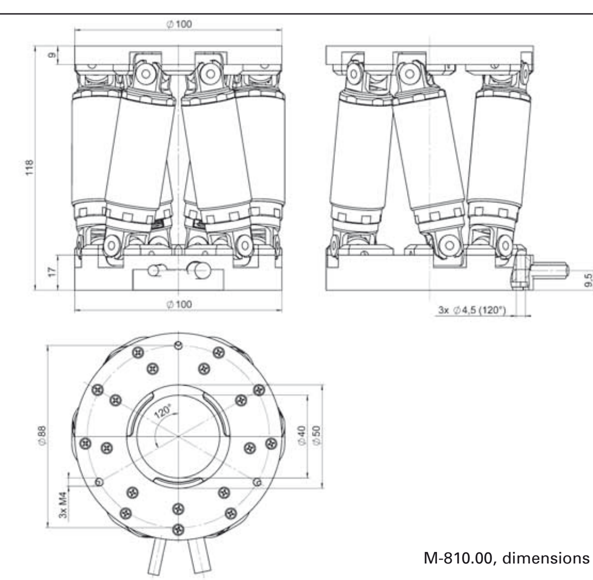
Extremely Compact, Great Freedom of Motion

The M-810.00 with its direct-drive torque motors and ActiveDrive™ system with integrated servo ampifiers provides an increased velocity of up to 10 mm/s for loads up to 5 kg. Small and compact, the Hexapod allows a large stroke of up to 40 mm (linear) and 60° (angular).

Hexapod vs. Serial Kinematics Systems

The Hexapod is driven by six high-resolution actuators all connected directly to the same moving platform. This design provides a high system stiffness and a large clear aperture.

Because of the low mass of the moving platform, positioning operations can be performed with far lower settling times than with conventional,



M-810.00, dimensions in mm

stacked multi-axis systems. In such systems, runout, guiding errors, and the friction and inertia of moving cables all accumulate to limit accuracy and repeatability-problems which do not affect parallel kinematic systems like the Hexapod.

User-Defined Pivot Point

For optics and other alignment tasks, it is important to be able to define a fixed pivot point. The sophisticated Hexapod-controller allows choosing any point in space as the pivot point for the rotation axes with a simple software command. The pivot point remains fixed relative to the platform.

Target positions in 6-space are entered in user-friendly coordinates and reached by smooth vectorized motion.

Open Architecture

Control of the hexapod is facilitated by the controller's open interface architecture, which provides a variety of high-level commands and includes a macro language for programming and storing command sequences.

Technical Data

	M-810.00	Unit
Active axes	X, Y, Z, ΘX, ΘY, ΘZ	
Motion and positioning		
*Travel range X, Y	±20	mm
*Travel range Z	±6.5	mm
*Travel range ΘX, ΘY	±11	°
*Travel range ΘZ	±30	°
Actor drive	Brushless DC Motor, ActiveDrive™	
Actuator stroke	±7.5	mm
Single-actuator design resolution	0.04	µm
Integrated sensor	Rotary encoder	
Sensor resolution	12800	Cts./rev.
**Min. incremental motion X, Y	1	µm
**Min. incremental motion Z	0.2	µm
**Min. incremental motion ΘX, ΘY, ΘZ	3.5	µrad
Repeatability X, Y	±2	µm
Repeatability Z	±0.5	µm
Repeatability ΘX, ΘY, ΘZ	±5	µrad
Backlash X, Y	2	µm
Backlash Z	0.5	µm
Max. velocity X, Y, Z	10	mm/s
Max. velocity ΘX, ΘY, ΘZ	250	mrad/s
Typ. velocity X, Y, Z	5	mm/s
Typ. velocity ΘX, ΘY, ΘZ	120	mrad/s
Mechanical properties		
Stiffness X, Y	0.1	N/µm
Stiffness Z	4	N/µm
Max. load (baseplate horizontal / any orientation)	5 / 2.5	kg
Miscellaneous		
Operating temperature range	0 to +50	°C
Material	Stainless steel, aluminum	
Mass	1.7	kg
Controller		
Operating Voltage	100–240 VAC, 50/60 Hz	

* The travel ranges of the individual coordinates (X, Y, Z, ΘX, ΘY, ΘZ) are interdependent. The data for each axis in this table shows its maximum travel, where all other axes are at their zero positions. If the other linear or rotational coordinates are not zero, the available travel may be less.

** Six-axis move. No moving cables (unlike serial-kinematic stacked systems). Eliminates bending, inertia and friction, improving accuracy.

Technical data are specified at 20 ±3°C. Data for vacuum versions may differ.