M-840 HexaLight™ 6-Axis Positioning System

High-Speed Parallel-Kinematics Micropositioner with Controller, to 50 mm/s

M-840 HexaLight™ 6D-Micropositioning System

- **Six Degrees of Freedom, Travel Ranges to 100 mm/ 60° Rapid Response**
- **No Moving Cables for Improved Reliability and Precision**
- **Load Capacity 10 kg, Self-Locking Version M-840.DG**
- **Velocity up to 50 mm/s**
- **Repeatability up to ±2 µm**
- **Encoder Resolution to 0.016 µm**
- **Significantly Smaller and Stiffer than Serial-Kinematics Systems, Better Dynamics**
- **Vacuum-Compatible Versions Available**
- **Virtual Pivot Point**
- **Sophisticated Controller Using Vector Algorithms**
- **MTBF 20,000 h**

The M-840 is the ideal Micropositioning System for all complex positioning tasks which depend upon high speed and accuracy in six independent axes.

Application Examples

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

Faster Positioning in All Six Axes

In comparison with the M-850 Hexapod (see p. 4-6 *ff*) the M-840 is designed for higher speeds and lighter loads. Loads of up to 10 kg can be positioned at up to 50 mm/s and 600 mrad/s with micron accuracy. In addition to positioning all axes, it allows the user to define the center of rotation (pivot point) anywhere inside or outside the system envelope by one simple software command.

Two models are available: The M-840.5PD featuring higher speed and direct-drive actuators, and the M-840.5DG with a gear ratio that makes it self-locking.

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, 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.

Fixed Virtual 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 by 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

Ordering Information

M-840.5PD
Hexapod 6-Axis Parallel Kinematics Microrobot with Controller, Direct Drive

M-840.5DG
Hexapod 6-Axis Parallel Kinematics Microrobot with Controller, Gearhead Drive

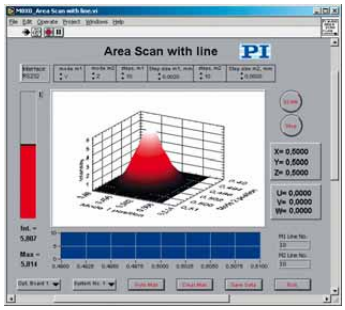
Optional Photometer

F-206.iiU
Photometer Card, IR Range, 2 Channels

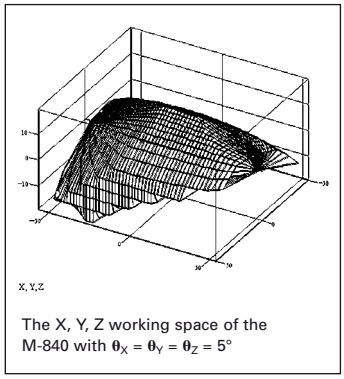
F-206.VVU
Photometer Card, Visible Range, 2 Channels

F-361.10
NIST Traceable Optical Power Meter, 1000 to 1600 nm

Ask about custom designs!



HexControl™ software showing scan of a fiber optics component



The X, Y, Z working space of the M-840 with $\theta_X = \theta_Y = \theta_Z = 5°$

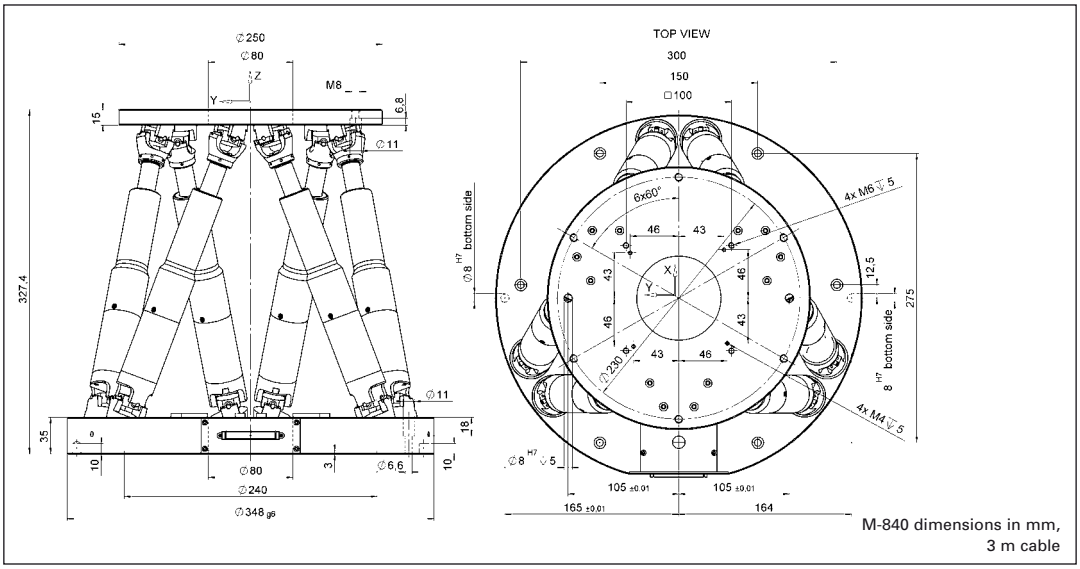
interface architecture, which provides a variety of high-level commands and includes a macro language for programming and storing command sequences.

Automatic Optical Alignment

With the internal or external photometer option and the integrated scanning routines, just a few commands are needed to perform an automated alignment of optical components. For more information on photometers / optical power meters, see www.pi.ws.

A smaller, even-more-precise hexapod, specially developed for alignment of collimators, fiber bundles and I/O chips, is available as the F-206 see p. 4-12 *ff.*

For a compact, vacuum-compatible Hexapod see M-824 see p. 4-10 *ff.*



M-840 dimensions in mm, 3 m cable

Hexapodcontroller with optional display and keyboard

High-Speed Photometer F-361

Technical Data

Model	M-840.5PD	M-840.5DG	Units
Active axes	X, Y, Z, θ_X, θ_Y, θ_Z	X, Y, Z, θ_X, θ_Y, θ_Z	
Motion and positioning			
*Travel range X, Y,	±50	±50	mm
*Travel range Z	±25	±25	mm
*Travel range θ_X, θ_Y,	±15	±15	°
*Travel range θ_Z	±30	±30	°
Actuator drive	DC-motor	DC-motor	
Actuator stroke	±25	±25	mm
Integrated sensor	Rotary encoder	Rotary encoder	
Sensor resolution	2048	2048	
Actuator design resolution	0.5	0.017	µm
**Min. incremental motion X, Y	3	1	µm
**Min. incremental motion Z	1	0.5	µm
**Min. incremental motion θ_X, θ_Y, θ_Z	5	5	µrad
Repeatability X, Y	±2	±2	µm
Repeatability Z	±1	±1	µm
Repeatability θ_X, θ_Y, θ_Z	±20	±20	µrad
Max. velocity X, Y, Z	50	2.5	mm/s
Max. velocity θ_X, θ_Y, θ_Z	600	30	mrad/s
Typ. velocity X, Y, Z	30	2	mm/s
Typ. velocity θ_X, θ_Y, θ_Z	300	20	mrad/s
Mechanical properties			
Max. load (baseplate horizontal/any orientation)	10 / 3	10 / 3	kg
Max. holding force (baseplate horizontal/any orientation)	15 / 5	100 / 25	N
Resonant frequency*** F_X, F_Y	100	100	Hz
Resonant frequency*** F_Z	300	300	Hz
Miscellaneous			
Operating temperature range	-10 to +50	-10 to +50	°C
Material	Aluminum	Aluminum	
Mass	12	12	kg
Controller			
Delivered controller	M-850.502	M-850.502	
Operating voltage	100–240 VAC, 50/60 Hz	100–240 VAC, 50/60 Hz	

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

*The max. travel of the several coordinates (X, Y, Z, θ_X, θ_Y, θ_Z) 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) to introduce bending forces, torque and friction which degrade positioning accuracy.
***Baseplate mounted horizontally without load

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Nanometrology
Micropositioning
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Single-Channel
Hybrid
Multi-Channel
Micropositioning Fundamentals
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