

Motorized Optical Mount Selection Guide

Newport offers a large selection of Motorized Optical Mounts to fulfill virtually any research or laboratory need. With the addition of New Focus, we have added the complete line of world class Picomotor driven optical mounts. Motorized optical mounts are great for automating sensitive lab or production optical systems, as well as making adjustments in tight spaces where manual adjustment is not possible.

Many of our standard mirror and optical mounts can be converted to motorized by adding our linear actuators. For a list of the options, see the motorized actuator and manual positioner compatibility guide on page 119.

For OEM or special applications, contact our sales and application engineers.

	Series	Optic Diameter [in. (mm)]	Angular Range (°)	Resolution
	Picomotor™ Mount with Controller Kits see page 176	1.0 (25.4)	±3	0.7 μrad
	Picomotor™ Series Motorized Optical Mounts see page 177	0.5 (12.7) to 2.0 (50.8)	±4	0.7 μrad
	Large Aperture Picomotor Optical Mounts see page 179	2.0 (50.8) to 4.0 (101.6)	±5°	0.7 μrad
	Pint-Sized Series Picomotor Optical Mounts see page 180	0.5 (12.7) to 1.0 (25.4)	±4	1.5 μrad
	Stability™ Series Piezomotor Optical Mounts see page 181	1.0 (25.4)	±4	0.7 μrad
	Stability™ Series Vacuum Compatible Motorized Optical Mounts see page 182			
	Motorized Flipper Mounts see page 183	1.0 (25.4) to 2.0 (50.8)	±2	87 to 183 μrad (resolution/5° turn)
	Agilis™ Series Piezo Motor Driven Optical Mounts see page 184	0.5 (12.7) to 1.0 (25.4)	±2	1 to 2 μrad
	FSM Series Fast Steering Mirrors see page 186	1.0 (25.4)	±1.5	≤1 μrad
	PSM2 Ultrafast Piezo Steering Mirror see page 187	Up to 1.0 (25.4)	±0.115	X, Y 0.004 μrad Z 0.03 nm
	NPO Series Objective NanoFocusing Stages see page 188	0.59 (15)	100 to 250 μm (linear)	0.3 to 0.5 nm (open loop)

New Focus Picomotor™ Mount with Controller Kits



- Picomotor controller and 2 mirror mount kits
- right/right, left/right or left/left handed configurations
- Includes model 8821 picomotor mirror mounts



The New Focus Picomotor™ Mount with Controller Kits utilize Model 8821 motorized optical mounts to combine the precision of standard mounts with the resolution of a Picomotor actuator to provide the ultimate in precision motorized optical alignment. The 8821 offers true set and forget stability, remote adjustment down to sub- μ rad, all in a very compact size that fits very well into tight spaces, including laser cavities.

For a complete and affordable solution to motorized tip and tilt alignment, use the Model 8742-4-8821-XX kits.

Model	Optic Diameter [in. (mm)]	Motorized Axes	Type
 8742-4-8821-LL	1.0 (25.4)	2	Clear Edge Center Mount
 8742-4-8821-RL	1.0 (25.4)	2	Clear Edge Center Mount
 8742-4-8821-RR	1.0 (25.4)	2	Clear Edge Center Mount

Specifications

8821	
Optic Diameter [in. (mm)]	1.0 (25.4)
Motorized Axes	2
Connector Type	4-Pin
Type	Clear Edge Center Mount
Angular Range (°)	± 3
Resolution- Angular (μ rad)	0.7
Cable Length [ft. (m)]	7 (2.1)
Thread Type	8-32 (M4) Thru

Ordering Information

Model	Description
8742-4-8821-LL	Picomotor Controller/Driver Kit, Inc. (2) 8821-L Picomotor Mounts
8742-4-8821-RL	Picomotor Controller/Driver Kit, Inc. 8821 & 8821-L Picomotor Mounts
8742-4-8821-RR	Picomotor Controller/Driver Kit, Inc. (2) 8821 Picomotor Mounts

Picomotor™ Series

New Focus Motorized Optical Mounts



Left to right: Models 8809, 8853 and 8807

- Compact design
- 0.7 μ rad angular resolution
- Picomotor™ actuators
- Set-and-forget long-term stability
- Easy-to-use, flexible controller/drivers



The New Focus Model 88xx motorized optical mounts combine the precision of New Focus standard mounts with the resolution of New Focus Picomotor™ actuator to provide the ultimate in precision motorized optical alignment. The compact Picomotor actuator housing adds only 0.75" (19.1 mm) to the overall thickness of these mounts. The angular resolution of these mounts is 0.7 μ rad.

For an affordable solution to motorized tip and tilt alignment, use the Model 8807 motorized version of this popular 1" center mount. Unlike other New Focus motorized mounts, this mount has Picomotor actuators on just two of its three adjustment axes.

The popular self-centering Opti-Claw mounts are even more versatile with Picomotor™ actuator adjustment capability. The Opti-Claw mount can hold any component with a diameter of 0.10" (2.54 mm) to 2.0" (50.8 mm), to a concentricity of <0.005" (0.127 mm). The tilting capability on this mount is motorized, while the claw used to grip the optic is not. The built-in setscrew locks the jaws as solidly as a fixed-diameter mount.

Specifications

	8806	8808	8807	8809	8812	8821	8852	8853	8854
Optic Diameter [in. (mm)]	NA	0.5 (12.7)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	2.0 (50.8)	2.0 (50.8)	1.0-2.0 (25.4-50.8)
Motorized Axes	3	3	2	3	3	2	3	3	3
Connector Type	4-Pin	6-Pin	4-Pin	6-Pin	6-Pin	4-Pin	6-Pin	6-Pin	6-Pin
Type	Blank Plate Mount	Corner Mount	Center Mount	Corner Mount	Gimbal Mount	Clear Edge Center Mount	Corner Mount	Gimbal Mount	Opti-Claw Mount
Angular Range (°)	± 4	± 4	± 4	± 4	± 4	± 3	± 4	± 4	± 4
Resolution- Angular (μ rad)					0.7				
Cable Length [ft. (m)]					7 (2.1)				
Thread Type					8-32 (M4) Thru				

Ordering Information

Model	Description
8806	Picomotor Motorized Blank Plate
8807	Picomotor Center Mount, 1.0 in. Diameter
8808	Picomotor Corner Mount, 0.5 in. Diameter
8809	Picomotor Corner Mount, 1.0 in. Diameter
8812	Picomotor Gimbal Mount, 1.0 in. Diameter
8821	Clear Edge Picomotor Mount, 1.0 in. Diameter
8821-L	Left-handed Clear Edge Picomotor Mount, 1.0 in. Diameter
8852	Picomotor Corner Mount, 2.0 in. Diameter
8853	Picomotor Gimbal Mount, 2.0 in. Diameter
8854	Picomotor Opti-Claw Mount, 0.1 to 2.0 in. Diameter

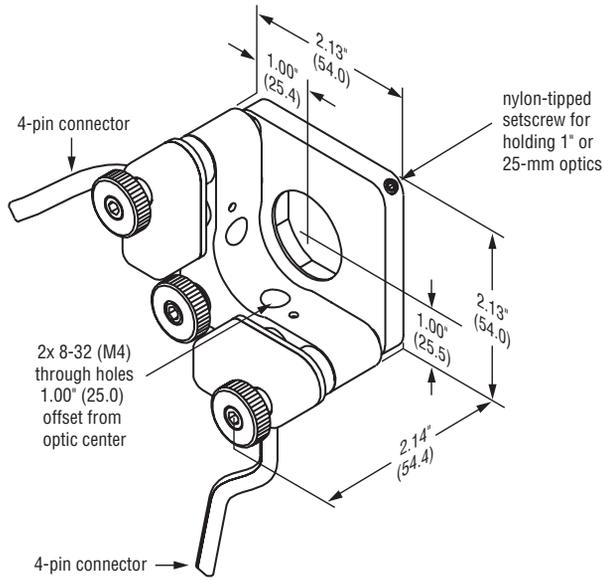
Recommended Motion Controller

8742 see page 166

MOTORIZED LINEAR STAGES
 MOTORIZED VERTICAL STAGES
 MOTORIZED ROTATION STAGES
 MOTORIZED LINEAR ACTUATORS
 HEXAPODS
 CONTROLLERS AND DRIVERS
MOTORIZED OPTICAL MOUNTS
 BEAM MANAGEMENT
 SPECIAL COLLECTIONS

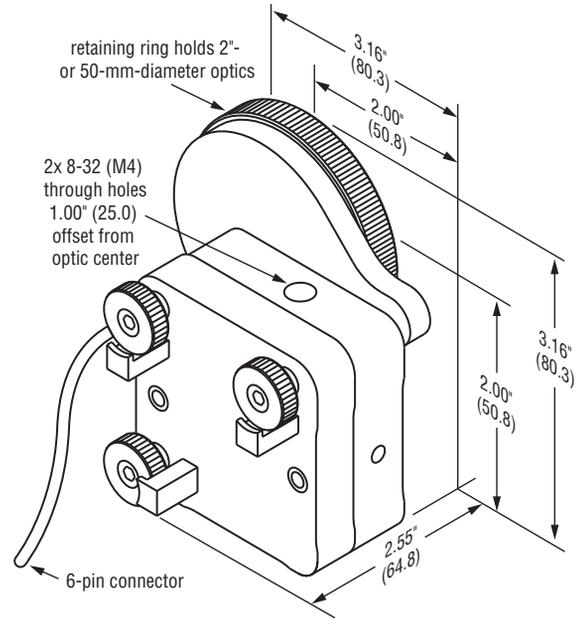
Model 8807

U.S. Patent #5,410,206



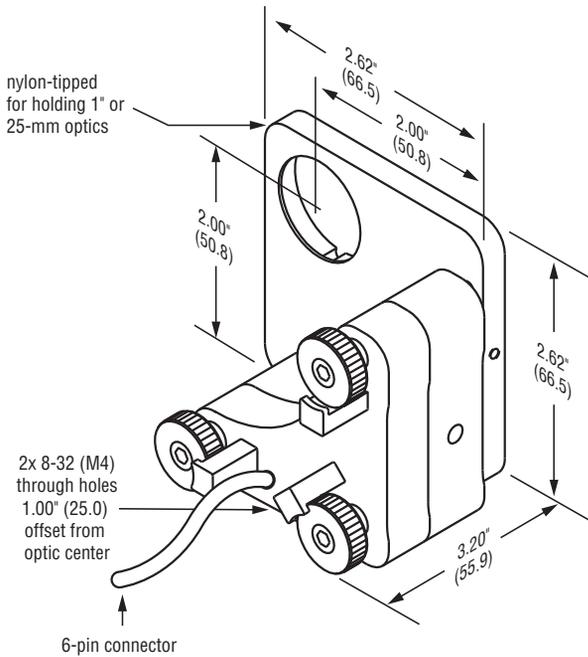
Model 8853

U.S. Patent #5,410,206



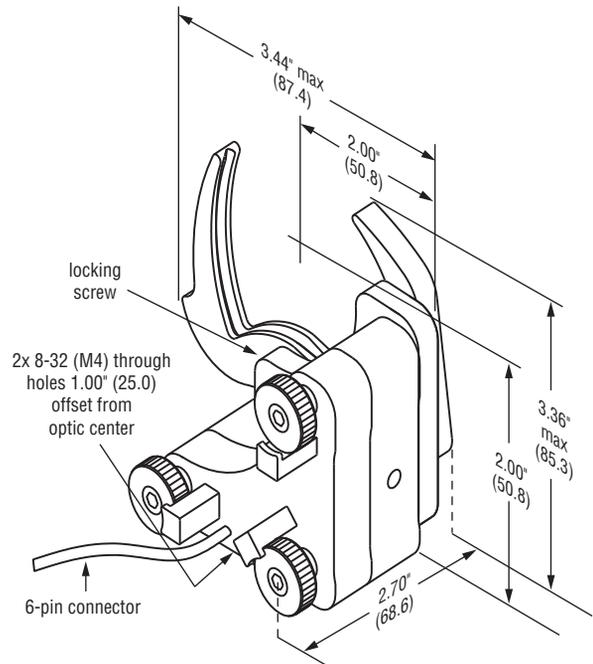
Model 8809

U.S. Patents #5,140,470 & #5,410,206



Model 8854

U.S. Patents #5,410,206, #5,140,470, & #5,168,168



New Focus Picomotor™ Large Aperture Optical Mounts

MOTORIZED
LINEAR STAGESMOTORIZED
VERTICAL STAGESMOTORIZED
ROTATION STAGESMOTORIZED
LINEAR ACTUATORS

HEXAPODS

CONTROLLERS
AND DRIVERSMOTORIZED
OPTICAL MOUNTSBEAM
MANAGEMENTSPECIAL
COLLECTIONS

- Kinematic Mechanism
- Θ_x , Θ_y Adjustments
- 0.7 μrad Angular Resolution
- Set-and-Forget Long-Term Stability
- Clear Edge or Center Mount
- Easy-to-use, flexible controllers

The New Focus 882X series provides the precision and stability of Picomotor™ actuators with the industry leading and proven Ultima Precision Optical Mounts.

This new series is available in aperture versions 2.0, 3.0, or 4.0 in (50.8, 76.2, 101.6 mm) diameter optics. With the thick front and rear plates, carbide seats, and optimized stiff springs, the 882X provides for smooth, reliable motorized adjustment while maintaining a high level of thermal and mechanical stability. The Picomotor offers the additional advantage of sub μrad resolution or just utilizing the integrated knobs for quick, manual adjustment.

The 8822 and 8823 versions, with the clear quadrant design, for mounting 2.0 and 3.0 in mirrors provide greater beam access. The 8822-AC, 8823-AC, and 8824-AC versions, with its low-distortional axial clamping technique, minimizes mount-induced wavefront distortions.

Specifications

	8822	8822-L	8822-AC	8823	8823-AC	8824-AC
Optic Diameter [in. (mm)]	2.0 (50.8)	2.0 (50.8)	2.0 (50.8)	3.0 (76.2)	3.0 (76.2)	4.0 (101.6)
Type	Clear Edge	Clear Edge	Center Mount	Clear Edge	Center Mount	Center Mount
Angular Range (°)	± 5	± 5	± 5	± 3.5	± 3.5	± 3.5
Cable Length [ft. (m)]				7 (2.1)		
Resolution- Angular (μrad)				0.7		
Mounting				Post		
Thread Type				8-32 (M4) CLR		
Motorized Axes				2 (Θ_x , Θ_y)		
Connector Type				4-Pin		

Ordering Information

Model	Description
8822	Picomotor Clear Edge Mirror Mount, 2.0 in. Diameter
8822-L	Picomotor Clear Edge Mirror Mount, 2.0 in. Diameter, Left-Handed
8822-AC	Picomotor Center Mirror Mount, 2.0 in. Diameter
8823	Picomotor Clear Edge Mirror Mount, 3.0 in. Diameter
8823-AC	Picomotor Center Mirror Mount, 3.0 in. Diameter
8824-AC	Picomotor Center Mirror Mount, 4.0 in. Diameter

Recommended Motion Controller

8742 see page 166

MOTORIZED LINEAR STAGES
MOTORIZED VERTICAL STAGES
MOTORIZED ROTATION STAGES
MOTORIZED LINEAR ACTUATORS
HEXAPODS
CONTROLLERS AND DRIVERS
MOTORIZED OPTICAL MOUNTS
BEAM MANAGEMENT
SPECIAL COLLECTIONS

Pint Sized Series

New Focus Picomotor™ Optical Mounts



Model 8885



- Ultra compact design
- 1.5 µrad angular resolution
- Set-and-forget long-term stability
- Easy-to-use, flexible controller/drivers
- Ultra-high vacuum versions

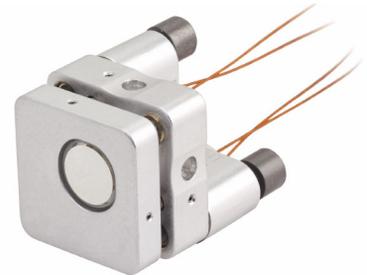
By adding New Focus Tiny Picomotor actuators to the popular Pint-sized mirror mounts, this results in an extremely small package, adding only 0.5" to the package, but with 1.5-µrad resolution. These motorized mounts eliminate problems usually associated with small systems where there is little room to make adjustments and requires highly sensitive adjustments by hand. These Pint-sized mounts are fully compatible with the posts, pedestals, and mounts.

The ultra-high vacuum version of the 8885 is designed for use in ultrahigh vacuum applications down to base pressures of 10⁻⁹ Torr which eliminates virtual leaks and utilizes materials with very low outgassing properties. The outgassing rate of this product is less than 5 ppm of volatile mass at 85°C over three hours. Kapton leads make this design more suitable in environments including vacuum ultraviolet (VUV) and extreme ultraviolet (EUV) applications. This pint-sized mount is fully compatible with standard posts, pedestals, and mounts.

Specifications

	8885	8886	8887
Optic Diameter [in. (mm)]	0.5 (12.7)	0.5 (12.7)	1.0 (25.4)
Motorized Axes	2	2	2
Resolution- Angular (µrad)	1.5	1.5	1.5
Angular Range (°)	±4	±4	±4
Connector Type	4-Pin	4-Pin	4-Pin
Cable Length [ft. (m)]	7 (2.1)	7 (2.1)	7 (2.1)
Type	Pint Sized Center Mount	Pint Sized Corner Mount	Pint Sized Corner Mount
Thread Type	#8 or M4 Counterbore	#8 or M4 Counterbore	#8 or M4 Counterbore

Model 8885-UHV



Ordering Information

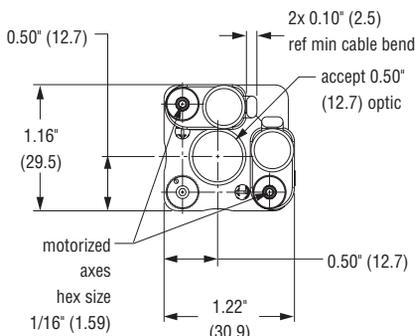
Model	Description
8885	Picomotor Pint-Sized Center Mount, 0.5 in. Diameter
8886	Picomotor Pint-Sized Corner Mount, 0.5 in. Diameter
8887	Picomotor Pint-Sized Corner Mount, 1.0 in. Diameter
8885-UHV	Ultra High Vacuum Picomotor Pint-Sized Center Mount, 0.5 in. Diameter

Recommended Motion Controller

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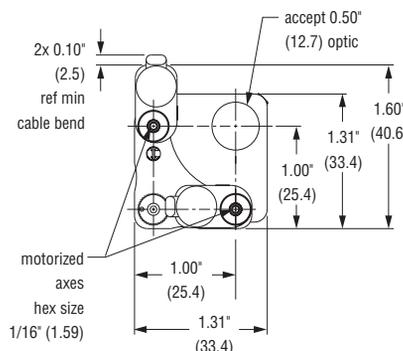
Model 8885

U.S. Patents #5,140,470 & #5,410,206

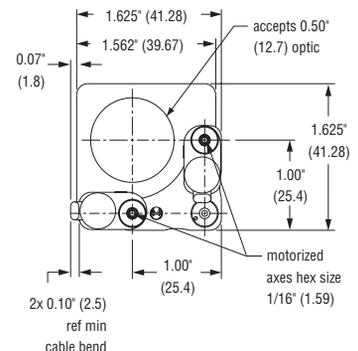


Model 8886

U.S. Patents #5,140,470 & #5,410,206



Model 8887



Stability™ Series

New Focus Picomotor™ Optical Mounts



Model 8816-6
U.S. Patent #5,410,206



- Unique retention system minimizes wavefront distortion
- 0.7 μ rad angular resolution
- Set-and-forget long-term stability
- Easy-to-use, flexible controller/drivers
- Vacuum versions

The Model 8816-X combines the stability of New Focus Stability™ mounts with the precision and stiffness of New Focus Picomotor™ actuators to provide the ultimate in precision motorized optical alignment. The compact Picomotor actuator housing adds only 0.75" (19.1 mm) to the overall thickness of these mounts. With two standard Picomotor actuators to provide tip and tilt adjustment, a complete remote control is provided. The unique optic-retention system minimizes wavefront distortion of the mounted optic as well as maximizes overall mechanical stability. Mirror installation and removal is simple and fast, requiring no adhesives.

The Model 8817-X is the vacuum-compatible version of the Model 8816-X. It offers ultraclean materials and components along with vacuum-compatible Picomotor™ actuators. Two “-V” vacuum-compatible Picomotor actuators provide full remote-control tip and tilt adjustment. As all New Focus vacuum-compatible products, the Model 8817-V is characterized using standard Gas Chromatography-Mass Spectrometry analysis (GCMS). It has been measured to outgas less than 0.1 ppm of volatile mass at 85 °C over three hours. Mass spectrograms detailing the exact outgassing compounds are available on request.

Specifications

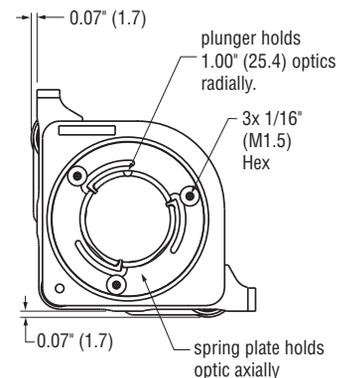
	8816-6	8816-8	8817-6-V	8817-8-V
Optic Diameter [in. (mm)]	1 (25.4)	1 (25.4)	1 (25.4)	1 (25.4)
Max Optic Thickness (mm)	6	8	6	8
Motorized Axes	2	2	2	2
Angular Range (°)	± 4	± 4	± 4	± 4
Angular Resolution	0.7	0.7	0.7	0.7
Vacuum Compatibility (Torr)	NA	NA	10^6	10^6
Cable Length [ft. (m)]	7 (2.1)	7 (2.1)	7 (2.1)	7 (2.1)
Connector Type	4-pin RJ-22	4-pin RJ-22	4-pin RJ-22	4-pin RJ-22

Ordering Information

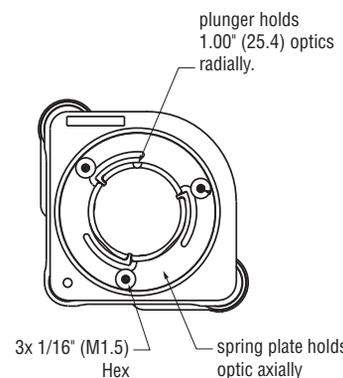
Model	Description
8816-6	Motorized Stability™ Mount, 1.0 in. Diameter, 6 mm Thick
8816-8	Motorized Stability™ Mount, 1.0 in. Diameter, 8 mm Thick
8817-6-V	Vacuum Motorized Stability™ Mount, 1.0 in. Diameter, 6 mm Thick
8817-8-V	Vacuum Motorized Stability™ Mount, 1.0 in. Diameter, 8 mm Thick

Recommended Motion Controller

8742 see page 166



Model 8817-V U.S. Patent #5,410,206



Model 8816

UHV Picomotor™ Large Aperture Optical Mounts



- Ultra-High vacuum compatible with kapton wires
- 0.7 μ rad angular resolution
- Clear edge or center mount versions
- Set-and-forget long-term stability
- Easy-to-use, flexible controller/drivers
- Kinematic Θ_x , Θ_y adjustments

Our ultra-high vacuum compatible Picomotor large aperture optical mounts are designed for vacuum applications. They provide the precision and stability of Picomotor actuators with our reliable Ultima Precision Optical Mounts. They are available in aperture versions for 1.0, 2.0, 3.0, or 4.0 in. diameter optics.

Clear Edge Versions

Versions with a clear quadrant design, offer a versatile positioning system for mounting 1.0 in, 2.0 and 3.0 in mirrors while providing the ability to pass a beam near the optic.



Center Versions Mount

Center mount versions offer a low-distortional axial clamping technique that minimizes mount-induced wave front distortions.



Specifications

	8821-UHV	8822-UHV	8822-L-UHV	8822-AC-UHV	8823-UHV	8823-AC-UHV	8824-AC-UHV
Optic Diameter [in. (mm)]	1.0 (25.4)	2.0 (50.8)	2.0 (50.8)	2.0 (50.8)	3.0 (76.2)	3.0 (76.2)	4.0 (101.6)
Type	Clear Edge	Clear Edge	Clear Edge	Center Mount	Clear Edge	Center Mount	Center Mount
Angular Range (°)	± 3	± 5	± 5	± 5	± 3.5	± 3.5	± 3.5
Cable Length [ft. (m)]				7 (2.1)			
Resolution- Angular (μ rad)				0.7			
Mounting				Post			
Thread Type				8-32 (M4) CLR			
Motorized Axes				2 (Θ_x , Θ_y)			
Connector Type				4-Pin			

Ordering Information

Model	Description
8821-UHV	Picomotor Clear Edge Mirror Mount, 1.0 in. Diameter
8822-UHV	Picomotor Clear Edge Mirror Mount, 2.0 in. Diameter
8822-L-UHV	Picomotor Clear Edge Mirror Mount, 2.0 in. Diameter, Left-Handed
8822-AC-UHV	Picomotor Center Mirror Mount, 2.0 in. Diameter
8823-UHV	Picomotor Clear Edge Mirror Mount, 3.0 in. Diameter
8823-AC-UHV	Picomotor Center Mirror Mount, 3.0 in. Diameter
8824-AC-UHV	Picomotor Center Mirror Mount, 4.0 in. Diameter

Recommended Motion Controller

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New Focus Motorized Flipper Optical Mounts



- Fast and stable movement in & out of beam path
- Flip-to-flip repeatability to better than 25 μ m
- Adjustable optic tilt
- Remote TTL or handpad control



Remotely flip an optic in and out of the beam path with a transit time of less than half a second. Originally designed for demanding commercial applications, Model 8892-K motorized Flipper mount offers excellent stability and repeatability. Optic tilt is adjusted with precision 80-pitch screws, and locking nuts preserve settings during flips. The Flipper mount's included handpad allows simple thumb control from a distance or more remotely via its TTL interface.

Specifications

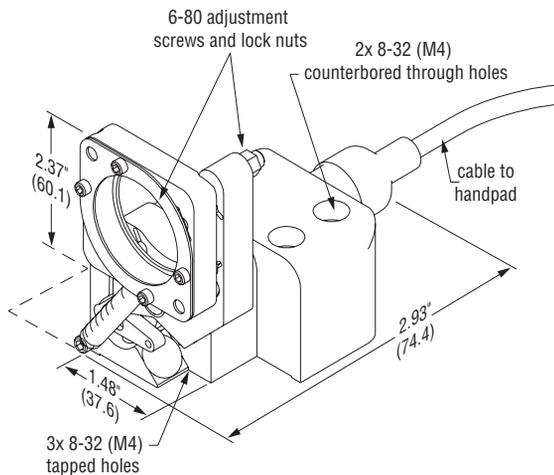
	8892-K	8892-K-M	8893-K	8893-K-M
Optic Diameter [in. (mm)]	1.0 (25.4)	1.0 (25.4)	2.0 (50.8)	2.0 (50.8)
Angular Range (°)	±2	±2	±2	±2
Connector Type	4 Pin	4 Pin	4 Pin	4 Pin
Type	Flipper Mount	Flipper Mount	Flipper Mount	Flipper Mount
Thread Type	8-32	M4	8-32	M4

Ordering Information

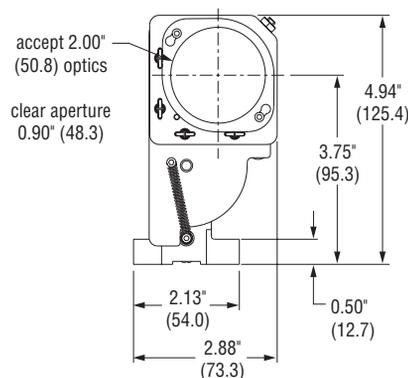
Model	Description
8892-K (8892-K-M)	Motorized Flipper Mount, 1.0 in. Diameter, Allen-Key Adjustment, 8-32
8892-K-M	Motorized Flipper Mount, 1.0 in. Diameter, Allen-Key Adjustment, M4
8893-K (8893-K-M)	Motorized Flipper Mount, 2.0 in. Diameter, Allen-Key Adjustment, 8-32
8893-K-M	Motorized Flipper Mount, 2.0 in. Diameter, Allen-Key Adjustment, M4



Model 8892-K



Model 8893-K



Agilis™ Series

Piezo Motor Driven Optical Mounts



- Outstanding adjustment sensitivity
- Set-and-forget long-term stability
- Limit switch versions
- Closed loop versions with integrated encoder
- Ultra-compact



Agilis optical mounts feature Newport's proven, proprietary, non-resonant piezo motors. These highly integrated motors are directly coupled to the moving optics holder for robust and predictable performance. When idle, the motor spring force locks the mirror in place, providing true set and forget stability. Agilis mounts also have a fast adjustment speed and are free of issues associated with backlash or hysteresis. In contrast to ultrasonic motors, the Agilis non-resonant motors makes small adjustments more predictable. With 50 nm minimum incremental motion capability on each motor, Agilis mounts are ideal for sensitive alignment and optical adjustments.

CONEX-Agilis mirror mounts have been designed with an integrated strain gauge to provide absolute positioning performance. Delivered with a compact, preconfigured CONEX controller, the CONEX-AG-M100D delivers repeatable positioning and is ideal for applications that require a return to a saved position. The CONEX-AG-M100D can also be power cycled without a loss to position feedback. This means that the position of the mount can be used as a diagnostic tool for alignment, while never requiring a reset of position. The integrated controller, also provides a full command set and only requires USB for power. CONEX-Agilis motorized mirror mounts are ideal for systems integration and remote adjustment of optics.

Specifications for Agilis Mirror Mounts

	AG-M050N	AG-M100N	AG-M050L	AG-M100L
Optic Diameter [in (mm)]	0.5 (12.7)	1.0 (25.4)	0.5 (12.7)	1.0 (25.4)
Angular Range (°)	±2	±2	±2	±2
Limit Switches	NA	NA	Proprietary electrical switches	
Adjustment Sensitivity (°)	0.0001	0.00006	0.0001	0.00006
Absolute Position Accuracy(°)	NA	NA	0.05 ⁽¹⁾	0.05 ⁽¹⁾
Maximum Speed (°/s)	0.75	0.5	0.75	0.5
Temperature Stability (°/°C)	0.0004	0.0002	0.0004	0.0002
Weight (kg)	0.025	0.085	0.025	0.085
Cable	1.2 m length, 4-wire mini-DIN connector			

⁽¹⁾ Maximum position deviation between before an MA command (measure absolute current position) and after a PA command (move to absolute position).

Specifications for CONEX-Agilis Mirror Mounts

CONEX-AG-M100D	
Optic Diameter [in. (mm)]	1.0 (25.4)
Dual Axis Travel Range (°)	±0.75
Closed Loop MIM (°)	0.001
Open Loop MIM (°)	0.0001
Repeatability (°)	0.01
Maximum Speed (°/s)	0.4
Temperature Stability (°/°C)	0.0003

Recommended Motion Controller for AG-xxx

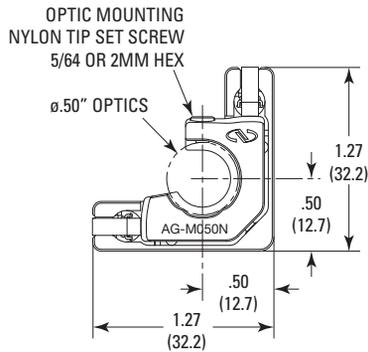
AG-UC2	see page 165
AG-UC8	see page 165
AG-UC8PC	see page 165

Ordering Information

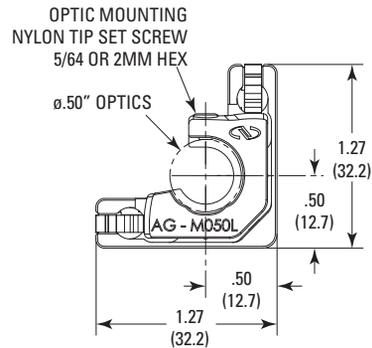
Model	Description
AG-M050N	Compact Piezo Driven Optical Mount, 0.5 inch Optic
AG-M050NV6	Compact Piezo Driven Optical Mount, 0.5 in., Vacuum Compatible
AG-M100N	Compact Piezo Driven Optical Mount, 1 inch Optic
AG-M100NV6	Compact Piezo Driven Optical Mount, 1 in., Vacuum Compatible
AG-M050L	Compact Piezo Motor Driven Optical Mount, 0.5 in., Limit Switches
AG-M050LV6	Piezo Driven Mount, 0.5 in., Limit Switches, Vacuum Compatible
AG-M100L	Compact Piezo Driven Optical Mount, 1 inch Optic, Limit Switches
AG-M100LV6	Piezo Driven Mount, 1 in., Limit Switches, Vacuum Compatible
CONEX-AG-M100D	Piezo Motor Mirror Mount, Absolute Positioning, Integrated Controller

Dimensions

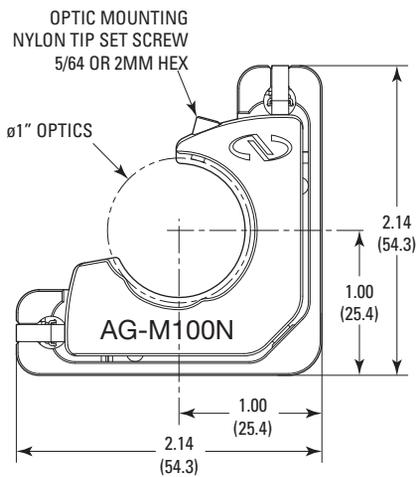
Model AG-M050N



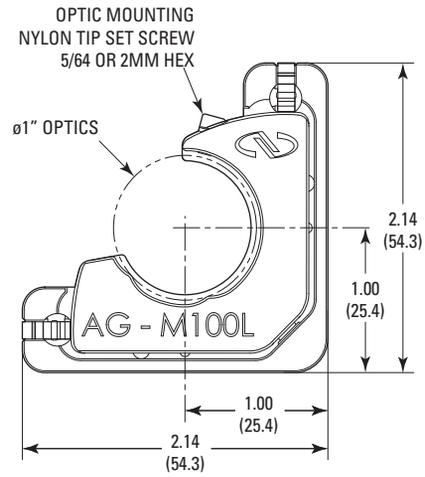
Model AG-M050L



Model AG-M100N



Model AG-M100L



Fast Steering Mirrors



Model FSM-300-01



- Fast closed-loop control, up to 580 Hz
- Field replaceable 1 inch mirror assemblies
- Fast steering on a single pivot point for X and Y rotation



The Fast Steering Mirror (FSM Series) provides two-axis, high-bandwidth tip/tilt with sub-microradian resolution using voice-coil technology. The FSM's that are economically viable for widespread commercial use for applications such as laser beam stabilization, laser pointing, tracking and image stabilization. By utilizing a unique flexure suspension design to confine the motion of the mirror, it eliminates the bearing surfaces often used with galvanometer scanners, along with their associated stiction and wear. This results in ultra-smooth tip/tilt motion about a common pivot point, with very high accuracy, and practically infinite lifetime.

Newport offers a standard FSM-300 with a 1" (25.4mm) diameter mirror. A position transducer is included in the FSM mirror head to provide position feedback with reference to the support frame. A wide range of 1" mirror assemblies (mirror on carrier) with different coatings are offered. This allows the user to field replace the standard mirror with another mirror that best fits the specific application. The 1" mirror assemblies are sold separately.

Typical Specifications

Mirror Assembly	FSM-300-01
Number of Axes	2 (tip-tilt)
Angular Range from ± 10 V (mrad)	± 26.2 ($\pm 1.5^\circ$), Mechanical ⁽¹⁾
Resolution, rms (μ rad)	1, Mechanical ⁽¹⁾
Repeatability, rms (μ rad)	3, Mechanical ⁽¹⁾
Accuracy from ± 26.2 mrad, 25°C ⁽¹⁾ (mrad)	0.262 (0.015°), Mechanical ⁽¹⁾
Linearity from ± 26.2 mrad, 25°C ⁽¹⁾	1.0%
Resolution of Local Position Sensor (μ rad)	0.5

1) Optical angular range is equal to twice the mechanical angular range.
 2) Optical parameters apply to central 80% of mirror aperture.

Controller/Driver	
Command Input and Position Output	Analog, ± 10 V yields ± 26.2 mrad
Peak Operating Power to Mirror (W)	30
Continuous Maximum Operating Power to Mirror (W)	15
Envelope, w x h x d [in (mm)]	9 x 3.45 x 10 (229 x 88 x 254)



FSM-300 Mirror Assembly



Front panel of the FSM-300 controller/driver.

Ordering Information

Model	Description
FSM-300-01	Fast Steering Mirror and controller, 1in Removable Mirrors w/ ER.1 Coating
FSM-300-02	Fast Steering Mirror and controller, 1in Removable Mirrors w/ ER.4 Coating
FSM-300-NM	Fast Steering System, 1 in. Mirror Fixture

For replacement mirror options visit www.newport.com

MOTORIZED LINEAR STAGES
 MOTORIZED VERTICAL STAGES
 MOTORIZED ROTATION STAGES
 MOTORIZED LINEAR ACTUATORS
 HEXAPODS
 CONTROLLERS AND DRIVERS
 MOTORIZED OPTICAL MOUNTS
 BEAM MANAGEMENT
 SPECIAL COLLECTIONS

PSM2

Ultra-fast Piezo Steering Mirror



- Sub-microradian positioning resolution
- Ultra-fast tip, tilt, and z motion
- Simple, maintenance-free operation
- Optional integrated strain-gauge



The PSM2 is a high-speed, tip, tilt, and z motion piezoelectric stage for mirrors, gratings and other optics with sub-microradian resolution. Equipped with a direct piezoelectric actuation system, minus the lever arm transmission, the PSM2 is ideally suited for high bandwidth laser beam steering, switching and stabilization, beam scanning, image stabilization, and laser cavity tuning.

Fast and reliable motion is supplied by three multi-layer, low-voltage piezo stacks (PZT) in a triangle configuration. The length of each piezo stack can be controlled individually. Applying a voltage to one stack, results in a rotation. Changing the length of all three stacks simultaneously, results in a linear z-displacement.

The PSM2 models are internally preloaded and can be mounted in any orientation. The PSM2 supports mirrors up to 50 mm diameter and can be glued directly to the top plate.

Specifications

Active Axes	PSM2	PSM2SG
	Open Loop (-D)	Closed Loop (-D)
Angular Range, x, y ($\pm 10\%$) (mrad)	2 ^(1,4)	1.6 ^(1,2,4)
Travel Range, Z ($\pm 10\%$) (μm)	16 ^(1,4)	12 ^(1,2,4)
Resolution, x, y (μrad)	0.004 ⁽³⁾	0.04 ⁽²⁾
Resolution, Z (nm)	0.03 ⁽³⁾	3 ⁽²⁾
Typ. Repeatability, x, y (μrad)	NA	1.3 ⁽²⁾
Typ. Repeatability, Z (nm)	NA	12 ⁽²⁾
Capacitance ($\pm 20\%$) (μF)	1.8	1.8
Resonant frequency, unloaded (Hz)	5400	5400
Stiffness in Z (N/ μm)	65	65
Max load (N)	1	1
Weight (kg)	0.085	0.085

¹ Typical value measured with NPC3 and NPC3SG, (-20 V to +130 VDC range).

² Applies to PSM2SG in closed-loop control only.

³ Equal to rms noise value measured with NPC3 and NPC3SG controller.

⁴ Linear travel and angular travel are interdependent. The values provided here are for pure linear or pure angular motion.

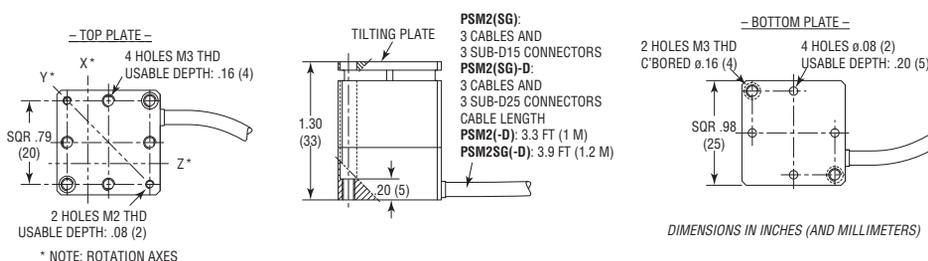
Ordering Information

Model	Description
PSM2	Piezo Steering Mirror, 2 mrad x 2 mrad x 16 μm , open-loop
PSM2SG	Piezo Steering Mirror, 2 mrad x 2 mrad x 16 μm , with strain gauge sensors

Order the -D version with an XPS controller.

Recommended Motion Controllers

Model	Description
NPC3	3-channel piezo stack amplifier, open-loop control
NPC3SG	3-channel piezo amplifier, strain-gauge position control
NPC1USB	Piezo Stack Amplifier, Single Channel, Low Cost
XPS-RL	-D versions only
XPS-D	-D versions only



NPO Series

Objective NanoFocusing Stages



- Sub-nanometer piezoelectric positioning resolution
- Piezoelectric travel range of 140 or 250 μm
- High resonant frequency for dynamic applications
- Precision parallelogram design minimizes beam offsets



The NPO Series NanoFocusing Objectives are high-speed, piezoelectric-driven devices providing fast focusing and scanning over long travel ranges of up to 250 μm and are compatible with most microscopes and objective lenses. Typical applications include surface profilometry, high-resolution imaging, auto-focusing, scanning interferometry, and confocal microscopy. NPO stages feature highly reliable, multi-layer, low-voltage, piezoelectric transducer (PZT) stacks. NPO NanoFocusing stages are available as open-loop (no position feedback) or closed-loop versions with integrated position feedback. The closed-loop systems (model numbers ending in SG) feature high resolution strain-gauge position sensors for highly accurate and repeatable motion.

The NPO NanoFocusing objective mount between the turret and the microscope objective and add only 11.5 mm to the optical path length. All models can be used for standard and inverted microscopes.

Specifications

	NPO140 (-D) NPO140SG (-D)	NPO250 (-D) NPO250SG (-D)
Open loop travel per axis ($\pm 10\%$), (μm) ⁽¹⁾	140	250
Closed loop travel per axis (μm) ^(1,2)	100	200
Open loop resolution (nm) ⁽³⁾	0.3	0.5
Closed loop resolution (nm) ⁽²⁾	3	5
Typ. Repeatability (nm) ⁽²⁾	30	46
Capacitance ($\pm 20\%$) (μF)	3.4	10.2
Resonant frequency, unloaded (Hz)	370	310
With 80 g load (Hz)	300	270
With 105 g load (Hz)	270	250
With 300 g load (Hz)	210	155
Axial stiffness (N/ μm)	1.4	0.4
Max lens weight (g)	500	500
Typ. Tilt, full travel (μrad)	<4	<10
Weight (g)	150	255

¹⁾ Typical value measured with NPC3 and NPC3SG, (-20 V to +130 VDC range).

²⁾ Applies to devices ending with SG in closed-loop control only.

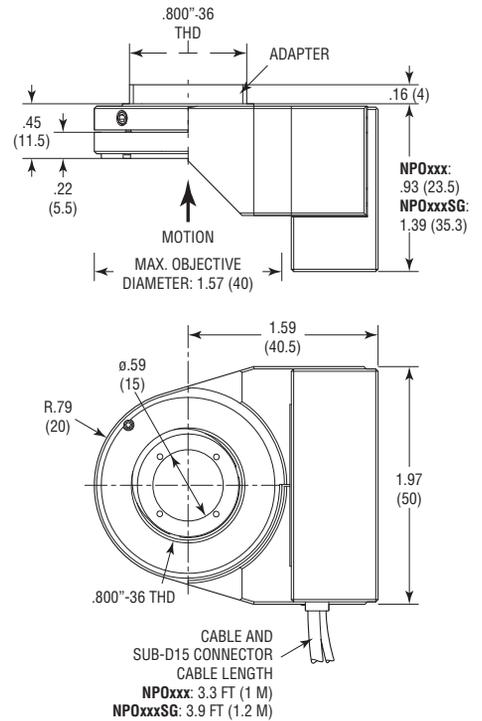
³⁾ Equal to rms noise value measured with NPC3 and NPC3SG controller.

Ordering Information

Model	Description
NPO100	Nanofocusing Open-loop Objective Stage, 100 μm
NPO100SG	Nanofocusing Objective Stage, 100 μm , Strain-gauge
NPO140	Nanofocusing Open-loop Objective Stage, 140 μm
NPO140SG	Nanofocusing Objective Stage, 140 μm , Strain-gauge
NPO250	Nanofocusing Open-loop Objective Stage, 250 μm
NPO250V6	Vacuum Nanofocusing Open-loop Objective Stage, 250 μm
NPO250SG	Nanofocusing Objective Stage, 250 μm , Strain-gauge
NPO250SGV6	Vacuum Nanofocusing Objective Stage, 250 μm , Strain-gauge

The -D version is compatible with the XPS controller and must be ordered with the XPS-DRVP1.

Dimensions



DIMENSIONS IN INCHES (AND MILLIMETERS)

Recommended Motion Controllers

Model	Description
NPC3	3-channel piezo stack amplifier, open-loop
NPC3SG	3-channel piezo amplifier, strain-gauge position control
NPC1USB	Piezo Stack Amplifier, 1-Channel, Low Cost
XPS-RL	-D versions only
XPS-D	-D versions only

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