

Agilis™ Series Piezo Motor Driven Positioners



Agilis™ Series

Piezo Motor Driven Positioners

Agilis series advantages

- Convenient hands-off remote adjustment
- Impressive 50 nm (0.2 arc-s) adjustment sensitivity
- Ultra-compact — ideal for space-constrained setups and system integration
- Set-and-forget long-term stability
- Manual control and USB interface
- Absolute positioning capability*

* Models with integrated limit switches only

... All this at a price comparable to a high quality manual positioner



Get better results with remote control

Achieving precise adjustment and repeatable positioning of optical setups can be difficult and time consuming. Newport's new Agilis series of piezo motor driven positioners takes a new approach to the adjustments needed for many laser setups. The Agilis series provides the ultra-high adjustment sensitivity and convenient remote operation of a motorized positioner at the economy and size of a high quality manual mount!

Today, the Agilis family includes mirror mounts for 0.5" and 1" diameter optics, including vacuum-compatible versions, linear stages, a rotation stage for 1" diameter polarization optics, and control electronics. But that is just the start. Soon, products like DUV-compatible mirror mounts (non-photo-contaminating), gimbal mounts, lens positioners and OEM electronics will be introduced to provide more solutions for precision remote control of optics, sensors and other devices.

Why Agilis positioners?

- *My fingers do not have the sensitivity to adjust a mirror mount with all the friction built into these mechanical systems.*
- *Whenever I make an adjustment, it seems my body heat alone affects the setting. I need to be away from the setup.*
- *Space is tight and there is not much room in the cavity.*

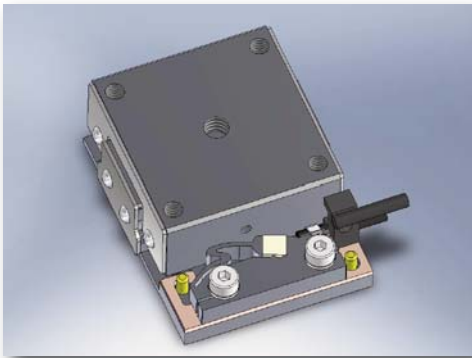
Mechanical friction and the effects of human operation limit the precision of many optical adjustments. In theory, it is possible to achieve sub arc-s adjustment sensitivity with very fine mechanics and differential screws. However, in practice, the lateral forces applied to a positioner during an adjustment often have an excessive effect, making alignments lengthy and frustrating. Also, many optical instruments and experiments are extremely sensitive to environmental factors and provide consistent results only when well shielded against external influences.

Customers need stable, highly sensitive, small, remote and easy to adjust opto-mechanics

Motorized positioners overcome the limits of manual positioners, but are typically costly and bulky, restricting their use for systems integration or simple remote operation in tight spaces. Agilis™ positioners provide a lower cost solution in a miniature size, without compromising adjustment sensitivity, speed, or position stability.

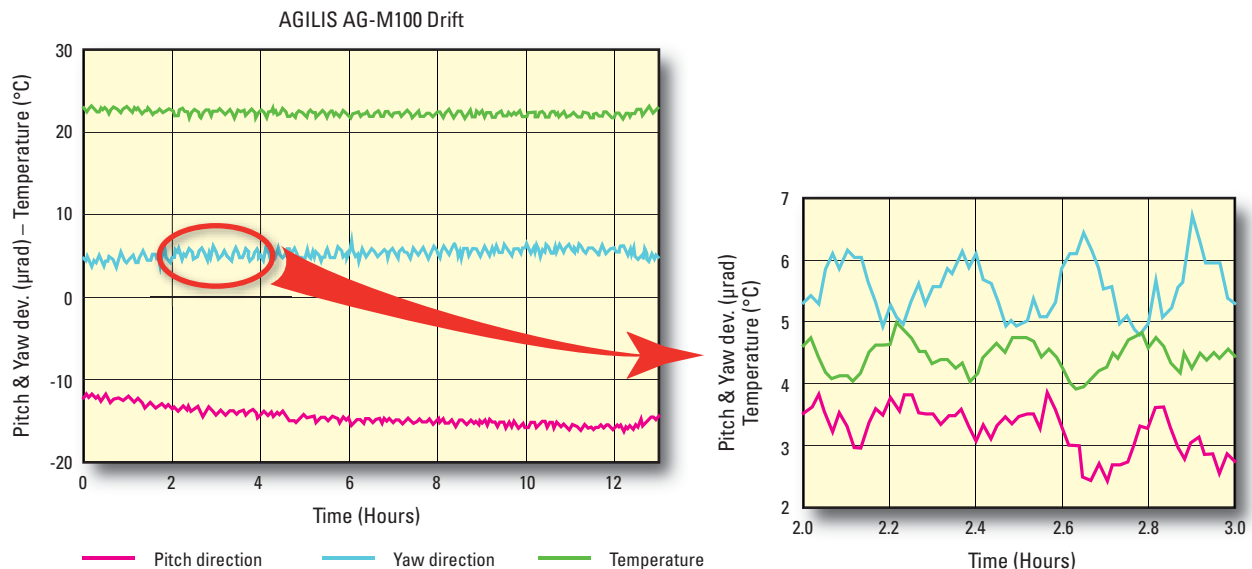
Superior non-resonant, piezo direct motor

Agilis motors features Newport's new, patent pending, non-resonant piezo direct motor. The motor consists of a piezoelectric ceramic embedded in a specially shaped solid state spring. The motor is directly coupled to the moving part and the friction forces of the solid state spring lock the position. A small motion step is achieved by sending a short, asymmetric electrical pulse to the motor. The direction of motion may be reversed by reversing the shape of the electrical pulse. When idle, there is no power on the motor for true set-and-forget long-term stability. So you can be confident that your setup will be maintained whether the motor is connected to the electronics or not.

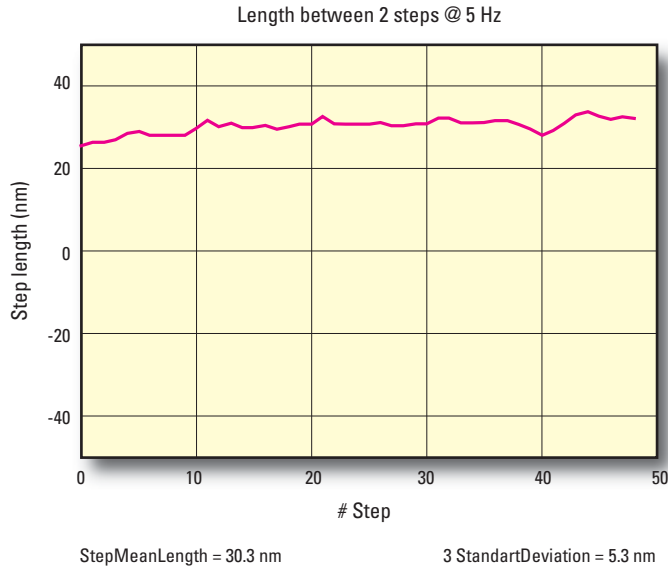


The direct coupling of the Agilis motors provides a number of advantages compared to alternative screw driven designs, such as far longer life, higher motion speeds and freedom from problems associated with backlash or hysteresis.

Furthermore, in contrast to ultrasonic motors, the Agilis non-resonant motor makes small adjustments more predictable. With 50 nm incremental motion capability and customer-adjustable step amplitudes, Agilis is perfectly suited to the most sensitive optical alignments.



Long-term stability measurement of an Agilis™ AG-M100N mirror mount. The AG-M100 shows less than 10 μrad drift over 13 hours with a direct correlation between temperature of the lab (± 1 °C) and the measured angle. Further measurements with larger temperature amplitudes confirm this thermal relation with a thermal tilt of 4 $\mu\text{rad}/^\circ\text{C}$ for an AG-M100.

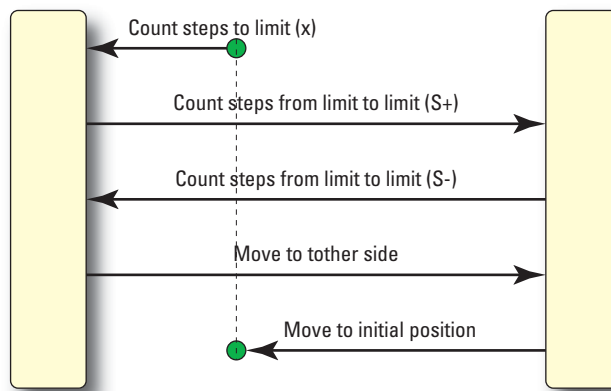


Interferometer measurement of the incremental motion capability of an Agilis AG-LS25 linear stage. The stage is capable of making increments of less than 50 nm with very low deviation of the individual step size (accurate adjustment of the step amplitude to the application is required).

Repeatable, absolute positioning capability

For repeatable absolute positioning, most positioners are available with precision electrical limit switches. These switches not only act as safety devices, they also allow repeatable absolute positioning without the need for expensive encoder feedback. This is accomplished by measuring the average step size from the left to the right travel limits and vice versa. Under consistent environmental conditions, the step size is fairly repeatable. Together with high level commands integrated into the AG-UC2 electronics, it is possible to register and return to a set position, anytime and anywhere.

For a mirror mount with a 4° adjustment range, the maximum deviation prior to an MA command (that is used to register the current position) and after a PA command (that moves the mount to an absolute position) is 0.05°. For comparison, an angle of 0.05° is approximately equivalent to 1/12 of a turn of a micrometer screw on a manual mount of comparable size.



Motion process associated to the MA command to register the current position. MA returns the distance of the initial position from the left travel limit (x).

Agilis™ AG-M050 and AG-M100 mirror mounts



Specifications

	AG-M050	AG-M100
Optic Diameter	0.5 in (12.7 mm)	1.0 in (25.4 mm)
Angular Range	±2°	±2°
Adjustment Sensitivity	2 μrad	1 μrad
Absolute Positioning	0.05°	0.05°
Accuracy/Repeatability ^{(1) (2)}		
Max. Speed	1.5 °/s	0.75 °/s
Thermal Tilt	7 μrad/°C	4 μrad/°C
Limits	Mechanical hard stop ⁽²⁾	
Weight	25 g	85 g
Cable Length	1.2 m length, 4-wire mini-DIN connector. Can extend cable length using AG-MD4-1.5 extension cable.	

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

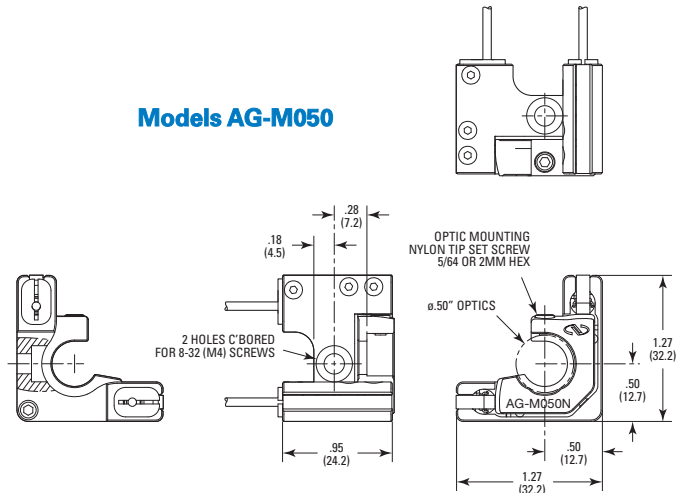
²⁾ Available with models AG-M050L and AG-M100L only.

The AG-M050 and AG-M100 are kinematic mirror mounts for optics with 0.5" and 1" diameter, respectively. For maximum compatibility, they feature the same optical beam height and almost the same lateral dimensions as Newport's popular Ultima® and Suprema® series manual mounts, but are narrower. The patented clear quadrant design exposes the edge of the optic, allowing beams to pass close to the edge of a mounted optic.

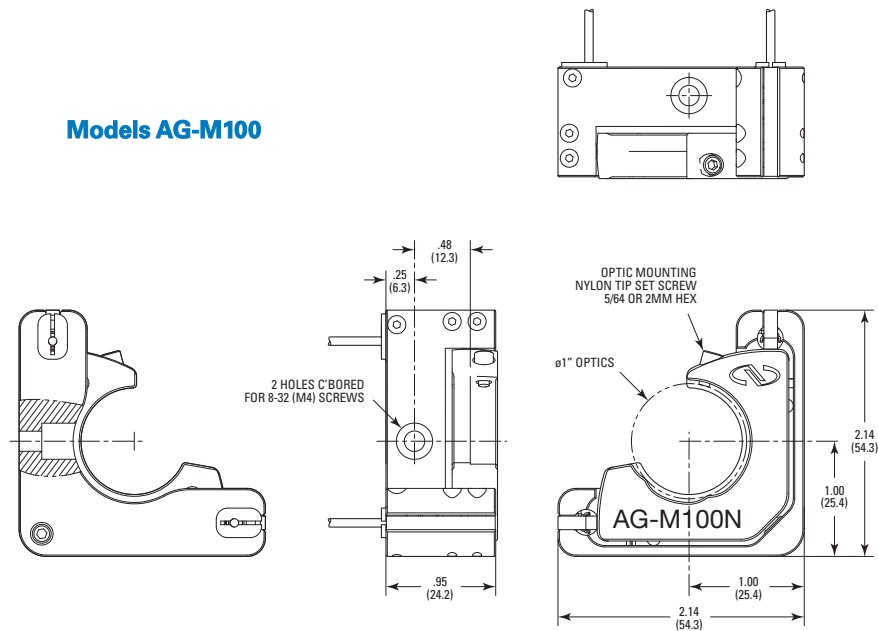
For repeatable absolute positioning, the AG-M050L and AG-M100L feature precision electrical limit switches (see Repeatability, absolute positioning).

For vacuum or high-class clean room applications, select mounts ending with V6. These mounts are especially prepared and tested up to 10⁻⁶ hPa vacuum.

Models AG-M050



Models AG-M100



Agilis™ AG-LS25 linear stage



The AG-LS25 is a high precision miniature linear stage featuring 12 mm travel in an ultra-compact and lightweight package, compatible with Newport's SDS25 and DS25 manual linear stages. Precision motion is achieved using calibrated, pre-stressed linear ball bearings. The thermally matched stainless steel design and precision manufactured bearing surfaces provide ripple-free, low friction linear travel and angular deviations better than 100 μ rad in all three axes.

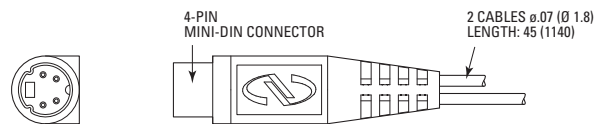
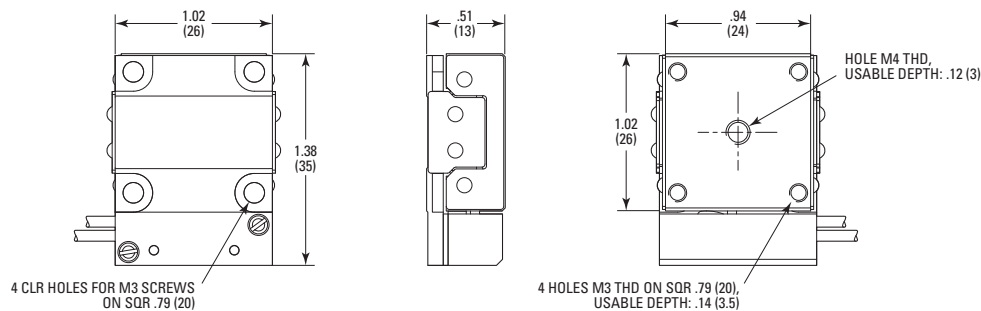
For absolute positioning, such as returning to a set position, the AG-LS25 features a precision electrical switch (see Repeatable, absolute positioning).

Specifications

Travel Range (mm)	12
Minimum Incremental Motion (μ m) ⁽¹⁾	0.05
Absolute positioning accuracy (μ m) ⁽²⁾	100
Maximum Speed (mm/s)	>0.5 with no axial load >0.2 with 1.7 N axial load
Normal load capacity (N)	3 (max. 40 mm cantilever)
Holding force (N)	3
Axial load capacity (N)	2
Pitch, Yaw (μ rad)	100
Material	Stainless steel
Weight [oz (g)]	2.5 (70)
Cable	1.2 m length, 4-wire mini-Din connector. Can extend cable length using AG-MD4-1.5 extension cable.
Life time	>1000 m (>500,000 cycles of \pm 1 mm motion)

¹⁾ The step size for forward and backward direction is adjustable. With default settings, the step size for the forward direction varies from the step size for the backward direction and may be larger than 50 nm. Individual steps are not 100% repeatable.

²⁾ For absolute positioning, the stage determines the average step size by counting the number of steps between the limits. The execution of an absolute positioning command may take up to 80 s.



Use the 339233 bracket for XZ and XYZ configurations. For XY assemblies of AG-LS25 stages, use 4 x TC M3x4 screws supplied with each stage.

B-Series adapter plates for mounting the AG-LS25 to optical tables and other 40 x 40 mm stages (see www.newport.com for details). For mounting AG-LS25 stages to these plates, use 4 x TC M2x4 screws plus washers supplied with each AG-LS25 stage.



Agilis™ AG-PR100 Rotation stage



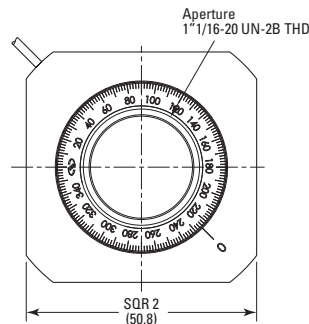
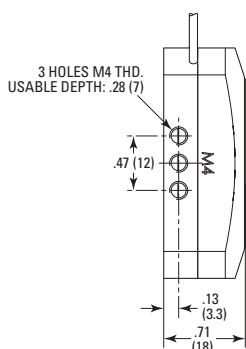
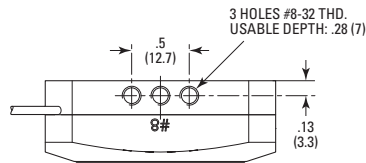
The AG-PR100 is an ultra-compact and lightweight rotation stage providing 360° continuous rotation for 1" diameter waveplates and polarizers. The inside diameter of the AG-PR100 comes with a 1.063"-20 thread and is compatible with the 10GT and 10GL series Calcite polarizers, the CH-0.5 cube beamsplitter holder, and the RSA-1TI thread insert. An A-1.25-1RR retainer ring is included with every stage.

Precision motion is achieved by a proprietary ball bearing design that ensures better than 100 μrad wobble.

Specifications

Travel Range	360° continuous
Minimum Incremental Motion ⁽¹⁾	5 μrad (1 arcsec)
Maximum Speed	2 °/s
Wobble	100 μrad
Weight	135 g
Graduation	2°
Cable	1.2 m length, 4-wire mini-Din connector. Can extend cable length using AG-MD4-1.5 extension cable.

¹⁾ The step size for forward and backward direction is adjustable. With default settings, the step size for the forward direction varies from the step size for the backward direction and may be larger than 5 μrad. Individual steps are not 100% repeatable.



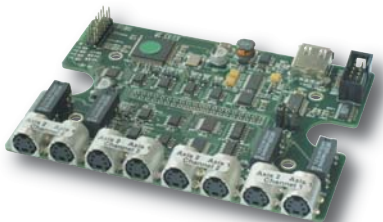
The AG-PR100 is post-mountable, shown above, and is compatible with metric and imperial threads. The coarse position can be read from the laser engraved scale, with 2° graduations.



Agilis™ AG-UC2 Controller

The Agilis™ AG-UC2 controller provides convenient push-button remote control and USB computer control of Agilis positioners. For each axis, the AG-UC2 controller features two rows of push buttons for step size settings, precise low speed adjustments and fast coarse motion. Power is supplied through the USB port and if this is not available, an independent power supply can be used to power the Agilis controller.

A software utility that comes with the controller allows the user to mimic the remote operation of the controller buttons through the computer and provides the ability to select and operate a specific Agilis positioner, as needed. A Windows DLL and LabView® VI's for all functions are provided as well.



AAG-UC8PC 8-channel PC-Board controller with RS-232, RS-485 and USB.

For OEM applications, an 8-channel controller (two channels active at a time) is available, with RS-232, RS-485 or USB interface on a 115 x 89 mm PCB. Upon request, the number of drive channels can be increased to 16, 24, 32, etc.

Ordering Information

Model	Description
AG-LS25	Agilis Linear stage, 12 mm travel
AG-M050L	Agilis mount with limit switches, 0.5-inch (12.7 mm)
AG-M050LV6	Agilis mount with limit switches, 0.5-inch (12.7 mm), vacuum compatible to 10 ⁻⁶ hPa
AG-M050N	Agilis mount, 0.5-inch (12.7 mm)
AG-M050NV6	Agilis mount, 0.5-inch (12.7 mm), vacuum compatible to 10 ⁻⁶ hPa
AG-M100L	Agilis mount with limit switches, 1.0-inch (25.4 mm)
AG-M100LV6	Agilis mount with limit switches, 1.0-inch (25.4 mm), vacuum compatible to 10 ⁻⁶ hPa
AG-M100N	Agilis mount, 1.0-inch (25.4 mm)
AG-M100NV6	Agilis mount, 1.0-inch (25.4 mm), vacuum compatible to 10 ⁻⁶ hPa

Model	Description
AG-MD4-1.5	Extension cable, 1.5 m, 4-wire mini-DIN connector
AG-PR100	Agilis Rotation Stage
AG-UC2	Agilis hand-held controller, 2-axis, USB interface
B-2B (M-B-2B)	Adaptor plate for optical tables
M-B-1.25	Adaptor plate for 40 x 40 mm stages
M-B-2C	Adaptor plate for optical tables
PRA-05	Adapter for 0.5" diameter waveplates
RSA-1TI	Solid Insert
USB-CH	Universal USB power supply, includes clips for US, EU, UK and Australia and 2-m USB cable
339233	Right angle bracket for AG-LS25

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Newport Corporation, Global Headquarters
1791 Deere Avenue, Irvine, CA 92606, USA

www.newport.com

PHONE: 1-800-222-6440 1-949-863-3144 FAX: 1-949-253-1680 EMAIL: sales@newport.com
Complete listings for all global office locations are available online at www.newport.com/contact

	PHONE	EMAIL
Belgium	+32-(0)0800-11 257	belgium@newport.com
China	+86-10-6267-0065	china@newport.com
France	+33-(0)1-60-91-68-68	france@newport.com
Italy	+39-02-92-90-921	newport@tin.it
Japan	+81-3-3794-5511	spectra-physics@splasers.co.jp
Taiwan	+886 -(0)2-2508-4977	sales@newport.com.tw

	PHONE	EMAIL
Mtn. View, USA	+1-800-775-5273	sales@spectra-physics.com
Netherlands	+31-(0)30 6592111	netherlands@newport.com
United Kingdom	+44-1235-432-710	uk@newport.com
Germany / Austria / Switzerland	+49-(0)6151-708-0	germany@newport.com



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