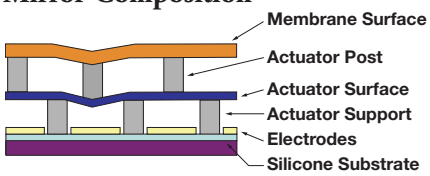
For current pricing, please see our website.

Deformable Mirrors (Page 1 of 2)

DM140-35-UM01
Multi-DM
12 x 12 Actuator Array

Mirror Composition



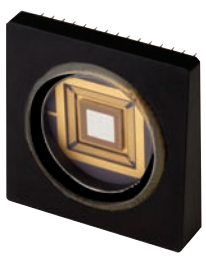
Through our partnership with Boston Micromachines Corporation (BMC), Thorlabs is pleased to offer BMC's Mini- and Multi-Deformable Micro-electro-mechanical systems (MEMS) based mirrors. These deformable mirrors (DMs) are ideal for advanced optical wavefront control; they can correct monochromatic aberrations (spherical, coma, astigmatism, field curvature, or distortion) in a highly distorted incident wavefront. MEMS deformable mirrors are currently the most widely used technology in wavefront shaping applications given their versatility, maturity of technology, and the high resolution wavefront correction capabilities they provide.

Thorlabs' DMs, fabricated using polysilicon surface micromachining fabrication methods, offer sophisticated aberration compensation in easy-to-use packages. The mirror consists of a mirror membrane that is deformed by either 32 electrostatic actuators (i.e., a 6 x 6 actuator array with four inactive corner actuators for the Mini-DM) or 140 electrostatic actuators (i.e., a 12 x 12 actuator array with four inactive corner actuators for the Multi-DM). These actuators provide 3.5 µm of stroke with zero hysteresis.

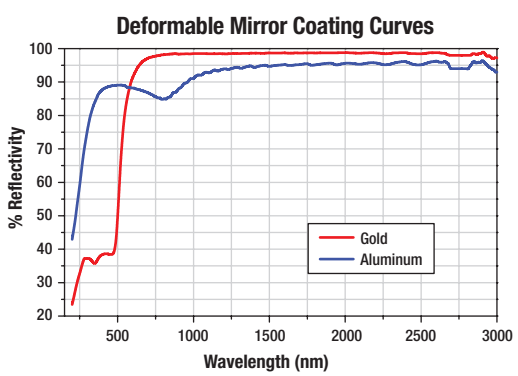
Both the Mini-DM and Multi-DM are available with either a gold (Au) or aluminum (Al) coated mirror. Each is packaged with a protective 6° wedged window that has a broadband AR coating for the 400 – 1100 nm range (See the graphs below for coating curves. Please contact our Technical Support Team if you have an interest in a different stroke or coating range). Although the use of DMs in astronomy is well known, these miniature, precision wavefront control devices are also helping researchers to make breakthroughs in beam forming, microscopy, laser communication, and retinal imaging.

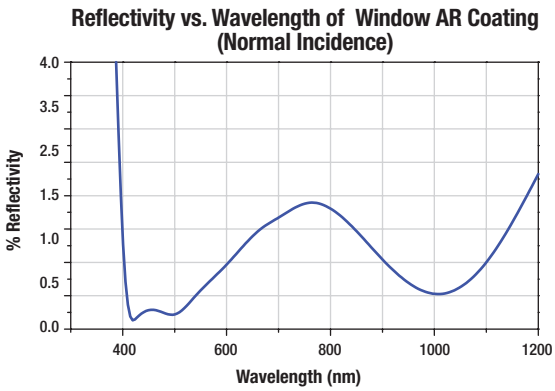
Features

- 32 (Mini-DM) or 140 (Multi-DM) Actuator Models Available
- 3.5 µm Maximum Actuator Displacement
- High-Speed Operation up to 34 kHz
- 400 µm Center-to-Center Actuator Spacing and Low Inter-Actuator Coupling Result in High Spatial Resolution
- Zero Hysteresis Actuator Displacement
- 14-Bit Drive Electronics Yield Sub-Nanometer Repeatability
- Compact Driver Electronics with Built-In High Voltage Power Supply Suitable for Benchtop or OEM Integration
- Operating Wavelengths
  - 400 – 1100 nm for Al-Coated DM
  - 600 – 1100 nm for Au-Coated DM
- Protective Window with 6° Wedge and Broadband AR Coating (400 – 1100 nm)
- Custom Coatings Available Upon Request



MEMS Deformable Mirror Chip





Typical reflectivity plots for aluminum- and gold-coated surfaces (without the protective window) as well as the AR Coating Curve for the protective 6° wedge. The data for the unprotected aluminum and gold coatings was obtained using unpolarized light incident at 45°.

Deformable Mirrors (Page 2 of 2)

Choosing a DM for Your Application

Ideally, the DM needs to assume a surface shape that is conjugate to, but half the amplitude of, the aberration profile to compensate for aberrations and yield a flat wavefront. However, the actual range of wavefronts that can be corrected by a particular DM is limited by the actuator stroke and resolution, the number and distribution of actuators, and the model used to determine the appropriate control signals for the DM; the first two are physical limitations of the deformable mirror itself, whereas the last one is a limitation of the control software.

The actuator stroke (i.e., the mechanical dynamic range or the maximum displacement) of the DM is an important performance parameter. Insufficient actuator stroke leads to poor performance and can prevent the convergence of the control loop.

The number of actuators determines the number of degrees of freedom for which the mirror can correct. Thorlabs' DMs are built with square actuator arrays for easy positioning on a Cartesian coordinate system and mapping on square wavefront sensor arrays. Additionally, the corner actuators of the square array are made inactive for better compensation of circular beams.

ITEM #	DM32-35-UM01	DM32-35-UP01	DM140-35-UM01	DM140-35-UP01
Actuator Array	6 x 6	6 x 6	12 x 12	12 x 12
Mirror Coating	Gold	Aluminum	Gold	Aluminum
Actuator Stroke (Max)	3.5 µm			
Actuator Pitch	400 µm			
Clear Aperture	2.0 mm x 2.0 mm		4.4 mm x 4.4 mm	
Average Step Size	<1 nm			
Fill Factor	>99%			
Mechanical Response Time	<100 µs			
Surface Quality	<20 nm (RMS)			
Head Dimensions (W x D x H)	4.4" x 2.8" x 2.9" (113 mm x 71 mm x 75 mm)			
Driver Specifications				
Frame Rate (Max)	8 kHz (34 kHz Bursts)			
Resolution	14 Bit			
Driver Dimensions (W x D x H)	4.0" x 5.25" x 1.25" (102 mm x 133 mm x 32 mm)		9.0" x 7.0" x 2.5" (229 mm x 178 mm x 64 mm)	
Computer Interface	USB2.0			

DM32-35-UM01
Mini-DM
6 x 6 Actuator Array

Deformable Mirrors, 6 x 6 Actuator Array Plus Driver

ITEM #	$	£	€	RMB	DESCRIPTION
DM32-35-UM01	$ 7,500.00	£ 5,400.00	€ 6.525,00	¥ 59,775.00	Mini-DM 6 x 6 Deformable Mirror with Gold Coating
DM32-35-UP01	$ 7,500.00	£ 5,400.00	€ 6.525,00	¥ 59,775.00	Mini-DM 6 x 6 Deformable Mirror with Aluminum Coating

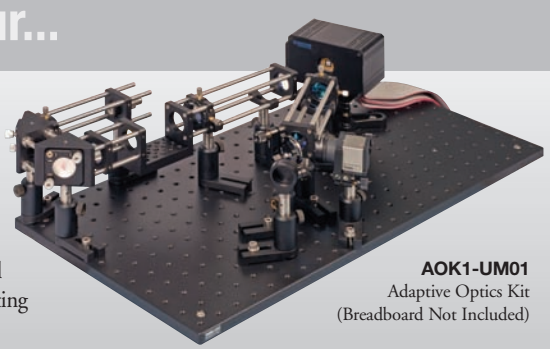
Deformable Mirrors, 12 x 12 Actuator Array Plus Driver

ITEM #	$	£	€	RMB	DESCRIPTION
DM140-35-UM01	$ 17,500.00	£ 12,600.00	€ 15.225,00	¥ 139,475.00	Multi-DM 12 x 12 Deformable Mirror with Gold Coating
DM140-35-UP01	$ 17,500.00	£ 12,600.00	€ 15.225,00	¥ 139,475.00	Multi-DM 12 x 12 Deformable Mirror with Aluminum Coating

These Deformable Mirrors are used in our...

Adaptive Optics Kits

In an effort to bring adaptive optics to more research fields, Thorlabs offers adaptive optics kits. These kits bundle the three primary components for any adaptive optics system: a MEMS-based deformable mirror (either gold- or aluminum-coated), a Shack-Hartmann Wavefront Sensor, and real-time control software. In addition, the kits also include a light source, all collimation/imaging optics, and all mounting hardware necessary.



AOK1-UM01
Adaptive Optics Kit
(Breadboard Not Included)

These kits are specifically designed to provide an economical, easy-to-use adaptive optics solution that can be integrated into a research system in hours instead of months.

For more details, see page 1790