

# Cellular-resolution Photostimulation

## Polygon DMD Pattern Illuminators

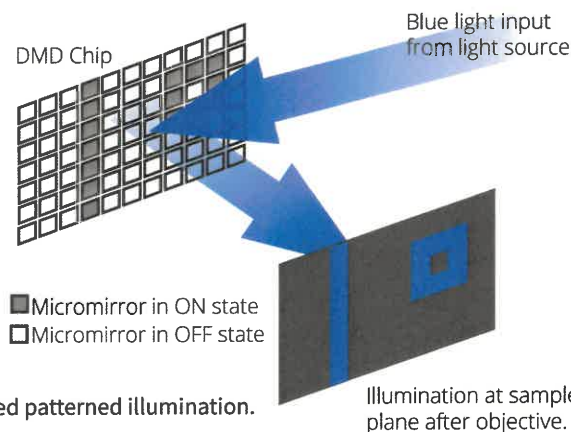


### INTRODUCTION

The Polygon DMD pattern illuminators are Mightex's market-leading modules for targeted photostimulation. The Polygon provides precise spatio-temporal control of light with subcellular resolution, making it the perfect illumination tool for scientific research. Compatible with any upright or inverted microscope, the Polygon enables researchers to send light to anywhere on their specimen, and in any shape, size and complexity now within a large projection field of view. In addition, multiple regions-of-interest (ROIs) can be illuminated simultaneously, and patterns can be switched at kHz speeds. Different wavelengths of light can be used with the Polygon for virtual simultaneous multi-color illumination of unique ROIs. Polygon systems seamlessly integrate via TTL with other equipment such as electrophysiology tools or cameras.

### DMD TECHNOLOGY

The Polygon uses digital micromirror device (DMD) technology to illuminate multiple ROIs simultaneously. A DMD chip is composed of up to millions of micromirrors that can be individually turned ON/OFF to reflect light onto the sample. Thus, you can assign each mirror to control the area(s) of illumination and create any number of different-sized ROIs simultaneously.



**Figure 1.** DMD-based patterned illumination.

### FEATURES

- Illuminate any Shape or Size Within Large Field of View
- Multi-Wavelength Illumination of Distinct ROIs
- Simultaneous Multi-Region Illumination
- Fast Pattern Switching Speed
- Fits on any Microscope
- External Equipment Synchronization

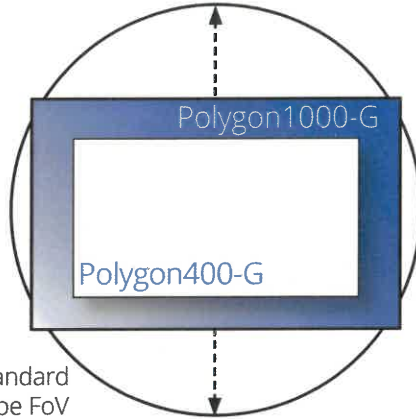
### APPLICATIONS

- Neuroscience: Single-cell Resolution Optogenetics
- Cell Biology: Subcellular Resolution Optogenetics
- Freely-Behaving Optogenetics
- Cortex-Wide Optogenetics
- Photoactivation, Photoconversion & Photoswitching
- Uncaging
- Photopatterning



# POLYGON1000

## MORE PIXELS, FASTER SPEED SAME VERSATILITY



22mm standard microscope FoV

- 82%** increase in illumination field of view\*
- Finer pixel resolution within larger field of view\*

\*Comparison between Polygon400-G model and large field-of-view Polygon1000-G.

### 1 Larger field of view. Finer resolution.

New, larger DMD chip combined with front tube optics enables larger field of view without compromising resolution and power.

### 2 Faster than anything else in the market.

Increased maximum frame rate means better temporal resolution for advanced physiologically-relevant experiments and virtually simultaneous 2-color illumination of distinct ROIs.



### 3 Real-time projection. Closed-loop experiments.

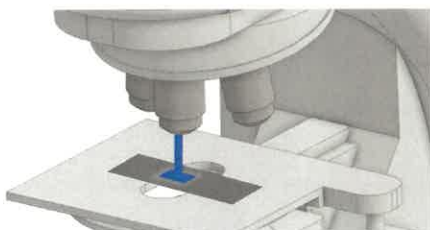
Faster uploading time enables the Polygon1000 to perform real-time pattern illumination for closed-loop experiments (faster than HDMI refresh rates [60Hz/120Hz]).

**4ms** uploading speed per frame



### 4 More power. Extra flexibility.

Larger chip and improved optics enhance transmission efficiency enabling the Polygon1000 to achieve increased power density at the specimen level, and giving the researcher more room for intensity control.



**45%** increase in optical power density\* at the specimen level

\*Comparison between Polygon400-G model and Polygon1000-G.



## POLYGON MODELS

### 1000 SERIES

#### POLYGON1000-G

P/N: DSI-K3-000

- Accepts a 3mm-core liquid lightguide.
- Can be used with any light source.
- Wavelength range: 350-700nm.
- Add-on front tube available for large field of view.

#### POLYGON1000-DL

P/N: DSI-K3-L20

- Accepts SMA-connectorized optical fiber patch cord (400µm, 0.22NA recommended).
- Compatible with laser sources.
- Wavelength range: 400-700nm.



### 400 SERIES<sup>s</sup>

#### POLYGON400-G

P/N: DSI-G-YYY



- Accepts a 3mm-core liquid lightguide.
- Can be used with any light source.
- Wavelength range: 400-700nm.





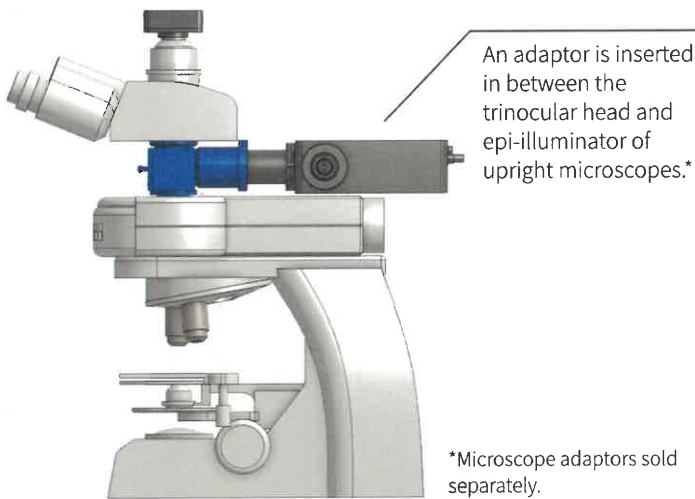
# MICROSCOPE INTEGRATION

The Polygon can be coupled to most commercially available inverted and upright microscopes (Nikon, Leica, Zeiss, Olympus) in the following configurations:

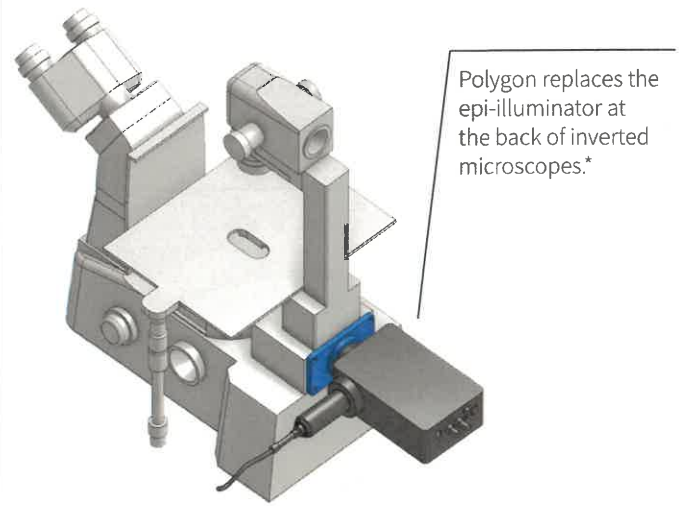
## INFINITY PATH CONFIGURATION

This configuration projects the spatial patterns at infinity, and hence it is mounted directly into the infinity path of a microscope by using a beam-combiner (for upright microscopes) along with an adaptor that matches the exact make/model of the microscope.

### UPRIGHT



### INVERTED



**PLEASE CONTACT MIGHTEX FOR INTEGRATION OF MULTIPLE POLYGONS AND ALTERNATIVE MICROSCOPE INTEGRATION SOLUTIONS.**

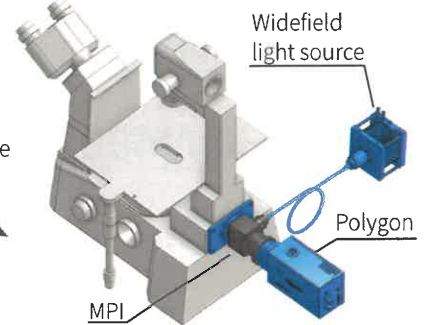
## MPI MULTI-PORT ILLUMINATOR

Mightex's MPI is designed for simultaneous mounting of a Polygon and a lightguide-coupled light source for epifluorescence widefield illumination. The mirror cube holds any standard sized microscopy dichroic, which can be easily replaced. If you use an inverted microscope where the back port is already occupied by a traditional epi-fluorescent illuminator, with an MPI you can keep the fluorescence imaging capability.

### HOW IT WORKS



### EXAMPLE CONFIGURATION



## C-MOUNT CONFIGURATION

If the infinity path of your microscope is unavailable, this configuration can be mounted onto one of the standard C-mount camera ports of your microscope.

## LAPP CONFIGURATION

Do you have a Nikon microscope with a LAPP modular illumination system? We provide a Polygon format that is LAPP compatible. Please contact Mightex for more information.



# TECHNICAL SPECIFICATIONS

## ILLUMINATION FIELD-OF-VIEW & RESOLUTION

Model	Field of View	Projection Area Dimensions	Commercial Microscope (1X Objective) <sup>a</sup>			
			Leica	Nikon	Olympus	Zeiss
<b>1000 SERIES</b>						
POLYGON1000-G	Standard	Height   mm	6.2	6.2	5.5	5.1
		Width   mm	9.9	9.9	8.9	8.1
		Diagonal   mm	11.6	11.6	10.5	9.6
		Pixel Size   $\mu\text{m}$	7.6	7.6	6.9	6.3
	Large <sup>c</sup>	Height   mm	12.4	12.4	11	10.2
		Width   mm	19.8	19.8	17.8	16.2
		Diagonal   mm	23.2	23.2	21	19.2
		Pixel Size   $\mu\text{m}$	15.2	15.2	13.8	12.6
POLYGON1000-DL <sup>b</sup>	Standard	Diameter <sup>b</sup>   mm	12.4	12.4	11	10.2
		Pixel Size   $\mu\text{m}$	15.2	15.2	13.8	12.6
<b>400 SERIES<sup>d</sup></b>						
POLYGON400-G	Standard	Height   mm	8.7	8.7	7.8	7.2
		Width   mm	15.5	15.5	13.9	12.7
		Diagonal   mm	17.7	17.7	16.0	14.6
		Pixel Size   $\mu\text{m}$	18.0	18.0	16.2	14.8

<sup>a</sup> To calculate illumination field-of-view and pixel resolution at the specimen, simply divide the above numbers by the magnification of the objective.

<sup>b</sup> Polygon1000-DL has a circular illumination field-of-view.

<sup>c</sup> Large field-of-view front tube lens required. Sold separately.

<sup>d</sup> Polygon400 series has been discontinued and replaced with the 1000 Series.

## CONTROL & TIMING

	400 SERIES	1000 SERIES
Maximum Frame Rate <sup>a</sup>   fps	4,000	6,600
Input Trigger	TTL, BNC connector	
Input Trigger Delay   $\mu\text{s}$	50	
Output Trigger	TTL, BNC connector	
Output Trigger Delay	User Programmable	
Input Uploading Speed   ms/frame	150	4

<sup>a</sup> Values at 1bit depth. For grayscale features please contact Mightex for more information.



## SYSTEM & COMMUNICATION

<b>Operating System<sup>§</sup></b>	Windows XP, Vista, 7, 8, and 10
<b>Software</b>	Mightex PolyScan2 Nikon NIS Elements NeuroPG*
<b>Interface</b>	SuperSpeed USB3.0
<b>Power Supply</b>	5Vdc 3A input power
<b>Screen Resolution</b>	1,366x768 or higher

<sup>§</sup>Polygon1000 supported by 64bit systems only.

\*Polygon400-G only

## ORDER NOW

Our primary goal is to help you find the optimal solution for your research. We have a dedicated technical support and sales team committed to providing expert guidance on our Polygon models and other Mightex products.



Please visit [www.mightexbio.com/contact](http://www.mightexbio.com/contact) to submit an inquiry form today!

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