

# Andor Mosaic 3

## Real Time Parallel Illumination of Multiple Regions

### Key Features

- ✓ Wavelength range 360 to 800 nm
- ✓ Minimum exposure time 50 – 200  $\mu$ s
- ✓ Maximum frame rate 5000 fps
- ✓ Comprehensive DMD triggering modes
- ✓ Long lifetime and low maintenance
- ✓ Wide range of light sources

### Key Applications

- ✓ Optogenetics
- ✓ Optophysiology
- ✓ Photoconversion
- ✓ Photoactivation
- ✓ Uncaging
- ✓ Photobleaching



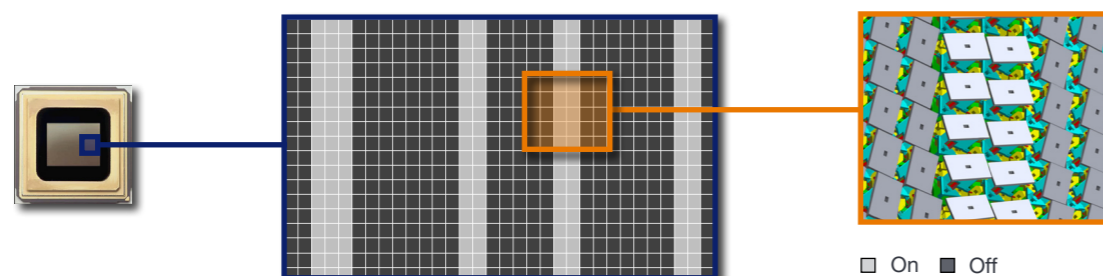
# Introducing Mosaic 3

Andor's Mosaic 3 is a patented instrument for targeted illumination for microscopy built around MEMS Digital Mirror Devices (DMD). High speed frame switching up to 5,000 fps makes the Mosaic 3 suitable for many dynamic applications including bleaching, uncaging, photo-switching, optogenetics and constrained illumination. Mosaic 3 exploits DMD in a proprietary programmable platform, integrated with scientific light sources including lasers, LEDs and arc lamps, and operates from 360 to 800 nm.

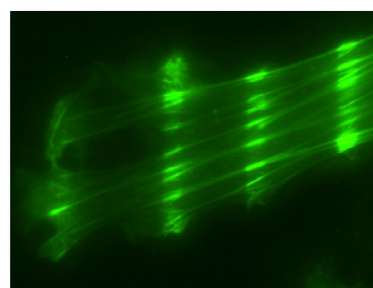
## DMD Technology

The core of Mosaic 3 is the Digital Mirror Device (DMD), a high speed and highly efficient semiconductor-based "light switch" array of hundreds of thousands of hinge-mounted, addressable, tiltable, microscopic mirrors.

When a DMD chip is co-ordinated with a digital video or graphic signal, a light source, and beam delivery optics, its mirrors reflect a digital image of the illumination mask onto the sample. This is represented in the illustrations below:



Each tiltable mirror of the 800 x 600 DMD array in the Mosaic 3 can be switched "on" or "off" to create the required illumination mask for the image.



Simultaneous multi-region photoactivation of GFP labelled actin in fibroblast.

Mosaic 3 is available in two models with two different fields of illumination and integrates with both upright and inverted microscopes:

### 1) Large field models

Provide illumination to fill most of the field of view of the microscope and match sCMOS camera FOVs. These models are commonly used for applications such as optogenetics and photoactivation where lower power densities are delivered by LEDs.

### 2) Small field models

Matches smaller sensor formats such as Andor's iXon 897 EMCCD and suited to applications including bleaching and uncaging where higher power densities delivered by lasers are required.



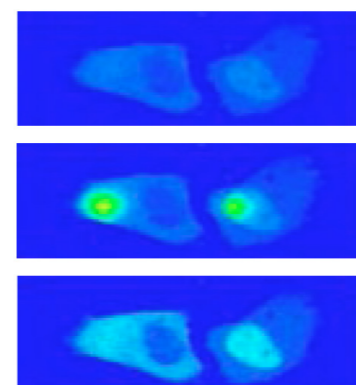
## Flexible Real-time Illumination Control

The on-board memory allows for sequences of patterns to be defined and executed with real-time accuracy under software control or following external trigger signals for ultimate experimental flexibility. A unique feature of the Mosaic family is the greyscale functionality for region-specific illumination intensity control in addition the binary operation of the DMD mirrors.

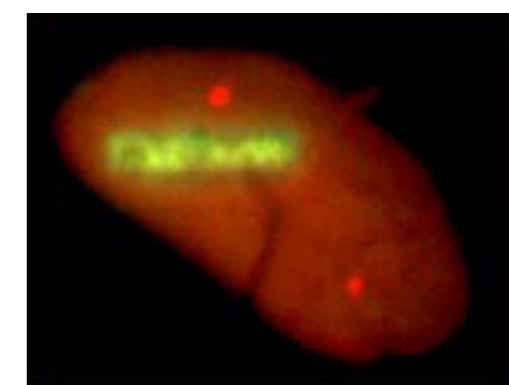
- ✓ Performs simultaneous imaging and photo-stimulation
- ✓ Delivers flexible, multi-ROI-specific control of illumination intensity
- ✓ Augments wide range of techniques: optogenetics, bleaching/activation and uncaging
- ✓ Ideal for high speed physiological studies
- ✓ Integrate with electro/optophysiology workstations

## Applications Guide

- ✓ **Optogenetics/Optophysiology** Cell signalling, Neuronal signalling, Electrophysiology, opsin controlled secondary messengers
- ✓ **Photoconversion/photoactivation** Cell dynamics, intracellular organelle tracking, cytoskeleton studies
- ✓ **Uncaging** Cell signalling, ion imaging, neurotransmission
- ✓ **Photobleaching** Protein dynamics, protein turnover, cell compartmentalisation



**Release of Caged Compounds.** Mosaic 3 can be used with UV sources including arc lamps, LED and lasers to uncage biomolecules and render them active (Eder and Bading, BMC Neurosci. 2007; 8: 57).



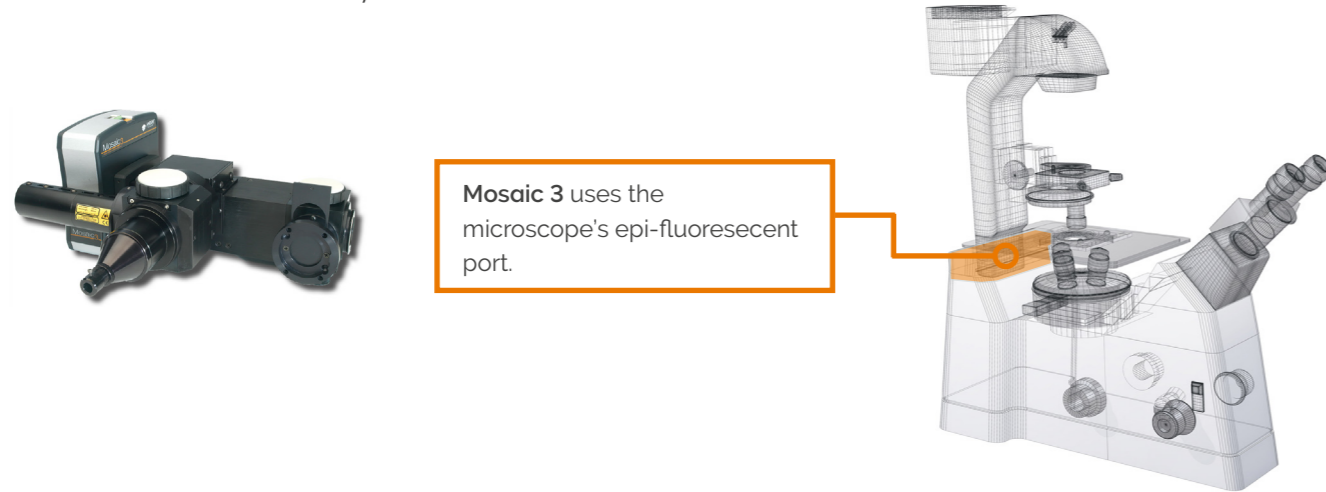
**Photoactivation** of pa:GFP-histone in U2OS nuclei lights up histones green in a linear region. This technique can be used to study histone mobility within the nucleus, in response to agonists and relative to other nucleoli or other compartments.

Learn more about how Mosaic 3 can be used to expand our understanding of cellular processes in live cells and model organisms:

- ✓ [Illumination Solutions for Photoactivatable Fluorescent Proteins](#)
- ✓ [Spatiotemporal Control of Cell Signaling using a Light-Switchable Protein Pair](#)
- ✓ [Illumination solutions for Uncaging Experiments](#)
- ✓ [Uncovering the Membrane Mechanism of Cytokinesis](#)

## How to Integrate Mosaic 3 into your Microscope

Mosaic 3 can be integrated into many of the most popular microscopes from major manufacturers that have an accessible epi-fluorescent port available. By using this, it is possible to combine illumination for visualisation and photostimulation simultaneously.

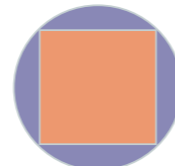


## Power Density and Field of Illumination<sup>\*4,5</sup>

**A**

### Large field models

- ✓ Provides illumination to fill most of the microscope field and matches the FOV of an sCMOS camera e.g Andor ZL41 Cell and Sona Extreme, and larger EMCCD formats e.g. iXon 888.
- ✓ Large field models are commonly used for applications such as optogenetics where lower power densities are delivered by LEDs.



**B**

### Small field models

- ✓ Provides illumination within a smaller field. Matches the iXon 897 EMCCD camera series.
- ✓ Small field models are suited to applications including bleaching and uncaging where **higher power densities**, delivered by lasers, are required.

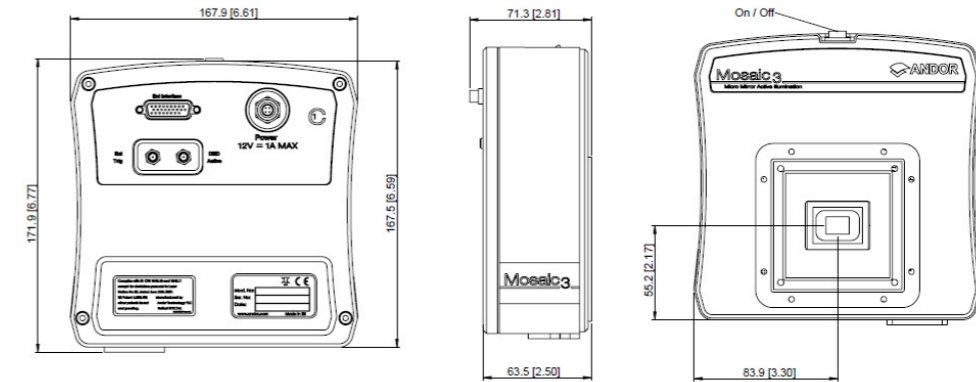


Please enquire about specific microscope compatibility and optical configurations possible.

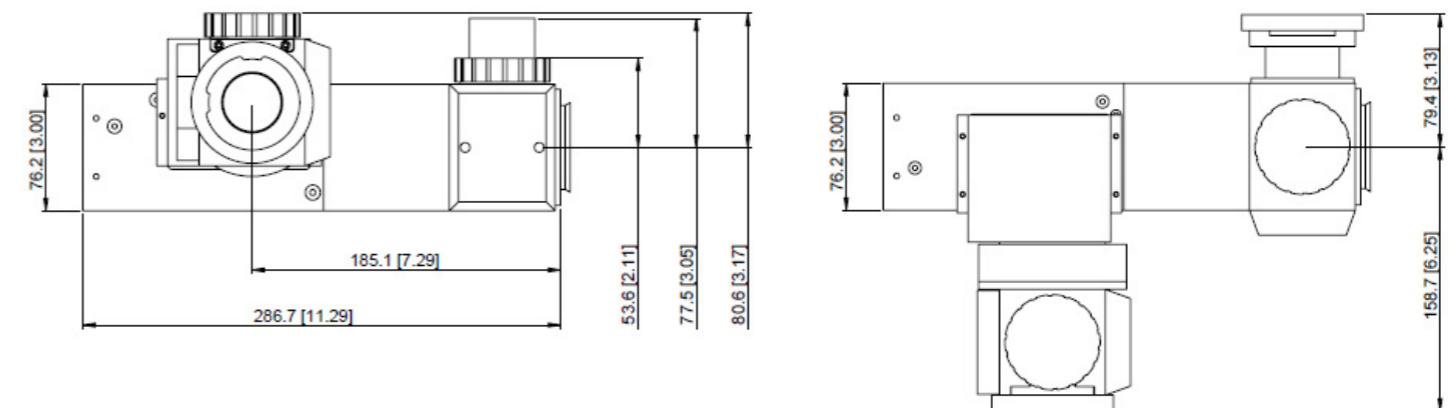
## Product Drawings: Mosaic Infinity Models (upright Microscopes)

Dimensions in mm [inches]

### Mosaic 3 Head



### Mosaic 3



## Technical Specifications<sup>\*2</sup>

### Optical Specifications

Transmission Range	360 nm to 800 nm (minimum 5% at all wavelengths)
Maximum Exposure Time	200 seconds and above - dependent on trigger mode
Minimum Sequence Mode Latency	200 $\mu$ s
External Trigger Rising Edge to Exposure Delay	< 200 $\mu$ s
Minimum Exposure Time Accuracy	+/- 1 $\mu$ s for all defined exposure times
Minimum Exposure Time Jitter	+/- 0.2 $\mu$ s

### Illumination Sources

Mosaic 3 Illumination Ports	Up to 2 ports on LHS for: two lasers/ one laser, one LED / two LEDs. <sup>*6</sup>
Lamp Sources	High Pressure Mercury Lamp XLED LED Light Source CoolLED e.g. pE300, pE100, pE400, pE800 LED
Laser Sources	405 and 445 High power Mosaic diode lasers Andor HLE (High Power Laser engine, for Dragonfly) Other - Please enquire

### Software Compatibility

Mosaic may be controlled via a range of 3rd party software, as well as by Andor's dedicated iQ software for photostimulation.

Andor Mosaic SDK	A software development kit that allows you to control the Mosaic 3. Available for Windows (8, 8.1, 10 and 11) and Linux. Compatible with C/C++, LabView and Matlab.
Andor iQ	Compatible with iQ 2.0 onwards in Single Shot mode.
3rd Party Support	MetaMorph MM7 version 7.7.1 onwards and NX version 2.5.275.0: in Single Shot mode only. NIS-elements version 4.20 onwards: single shot mode (and some additional sequencing functions). Mosaic control and targeted sequencing supported under MicroManager "projection" interface.
Other	Integrate with almost any other software using iQ's virtual camera feature. Continue using normal acquisition software with photostimulation controlled via iQ.

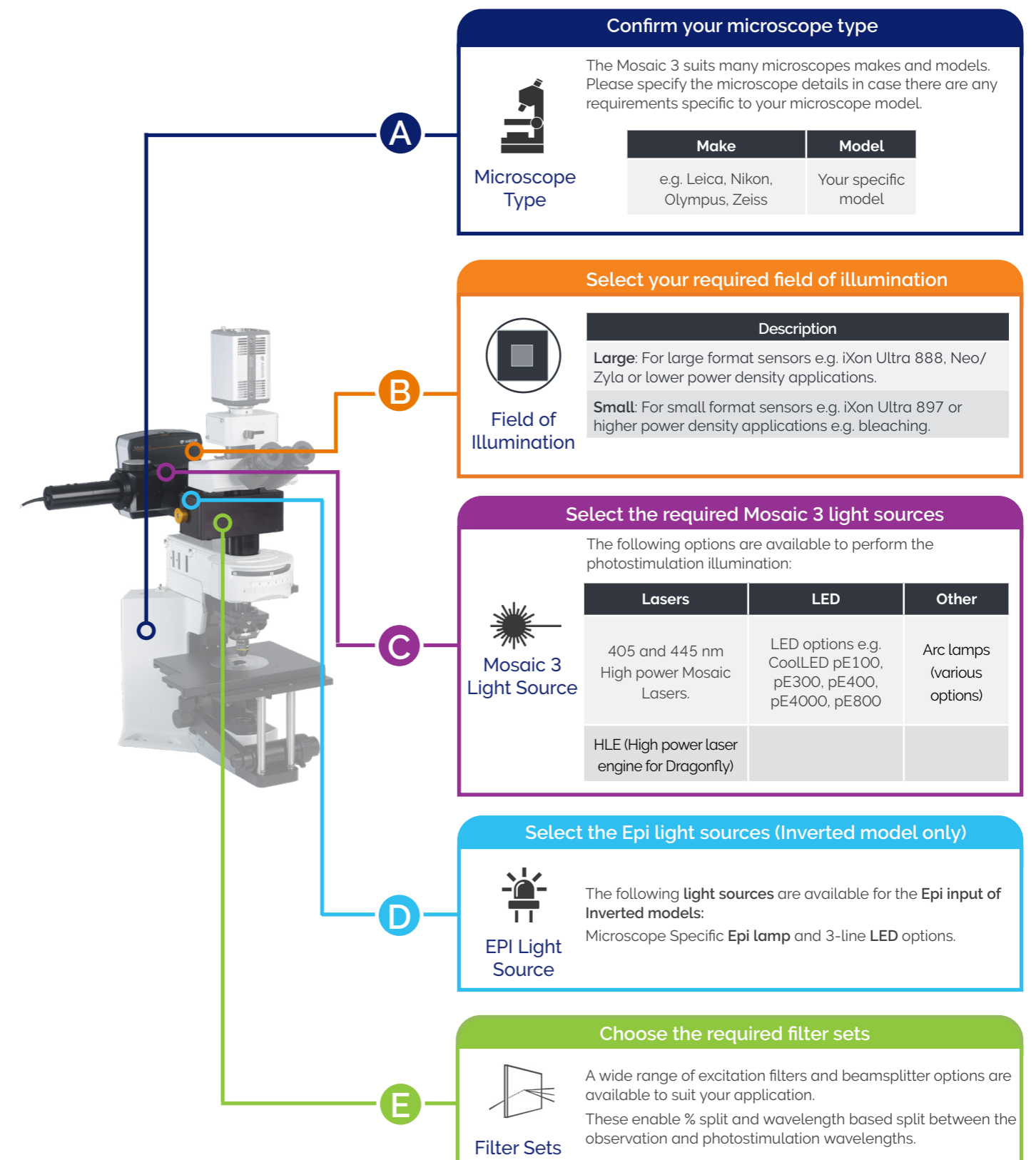
### Trigger Modes

Mirror On	Leave the selected mask on (image exposed) indefinitely.
Mirror Off	All DMD Mirrors 'Off' indefinitely.
Expose	Expose the selected mask for a defined exposure time.
Sequence Start <sup>*1</sup>	Trigger a predefined sequence of masks.
External Expose <sup>*1</sup>	Use another device to trigger exposure of the selected mask for a defined exposure time.
External Bulb Mode	Use another device to trigger exposure of the mask on the rising edge of the trigger signal and ending on the falling edge.
External Sequence Start <sup>*1</sup>	Use another device to trigger a predefined sequence of masks.

## Choosing your Mosaic 3 System

An overview of the building blocks required to configure a Mosaic 3 system is shown below:

Please discuss your exact application requirements with your customer representative.



## Order Today

Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products.

For a full listing of our local sales offices, please see: [andor.oxinst.com/contact](http://andor.oxinst.com/contact)

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### Product Compliance Information

#### Regulatory Compliance

- EU EMC/ LV/ RoHS2 Directives
- Safety-tested under IEC CB Scheme to IEC 61010-1
- Laser safety compliant for IEC 60825-1 and CDRH
- RoHS-compliant

#### External Power Supply Compliance

- UL-certified for U.S. and Canada
- U.S. FCC Mark
- Japan PSE compliant
- Korea KC Mark
- Taiwan BSMI Mark

#### Minimum Computer Requirements:

- Operating System: Windows 8.1, 10, and 11 32/64-bit.
- Sandy Bridge i5 Processor or better
- USB 3.0 Port or PCI Express x4 slot
- RAM: OS dependent, minimum 4GB recommended for fast streaming

#### PC Communications

- USB 3.0 (or slower USB 2.0)
- Optional PCIe x1 card supplied to provide a USB 3.0 port if needed

#### Laser Safety <sup>•3</sup>

Laser radiation is only present in Mosaic systems fitted with a laser. Some Mosaic systems use non laser-based light sources.

### Footnotes: Specifications are subject to change without notice

1. Currently available through self-integration using Mosaic 3 SDK.
2. Figures are typical unless otherwise stated.
3. Applies if fitted with a laser source.
4. Field number (figures are typical and subject to microscope make and model)
5. Mosaic 3 for inverted microscopes:
  - Large FOI: 18 to 22 mm (microscope dependent)
  - Small FOI: 5.8 to 11 mm (microscope dependent)
6. Dependent on Mosaic 3 model.

#### Mains Supply Requirements

- 100 - 240 VAC, 50/60 Hz 1 A max. steady state

#### Power Consumption

- DMD Head with External Power Supply (Typ. & Max.): 6W
- DMD Head Only (Typ. & Max.): 4.8W
- 405 nm Laser: 4.1W

#### Environmental Requirements

- Operating Temperature: 10°C to 30°C ambient
- Relative Humidity: < 70% (non-condensing)
- Storage Temperature: -20°C to 70°C

This product may be supplied with a variety of laser combinations and output powers at the microscope stage. The following two labels represent the extremes:

