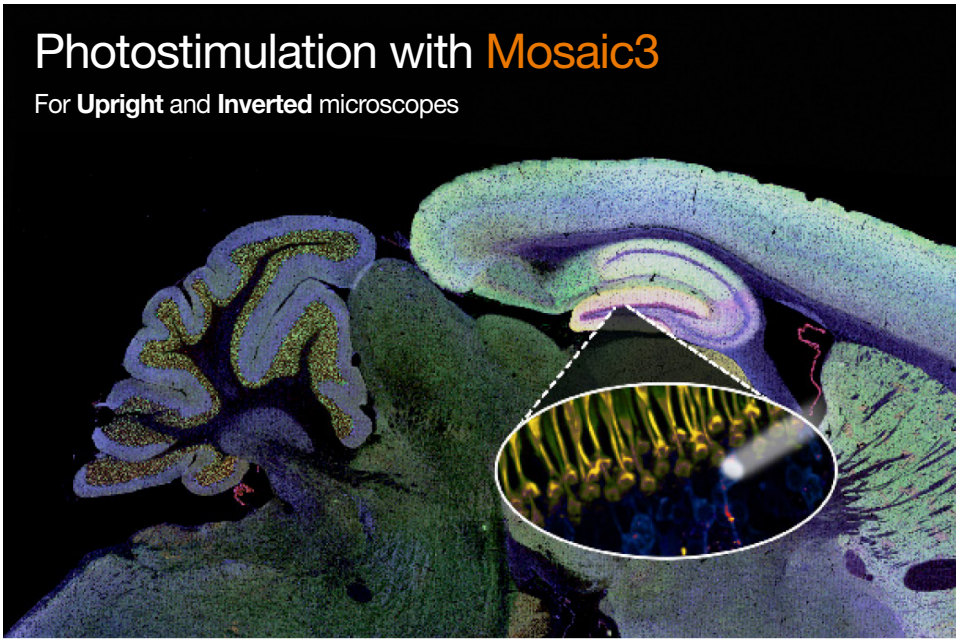


Features

- Simultaneous illumination of multiple regions of interest
- On-board pattern storage for high-speed ROI sequencing
- Region specific grey-scaling available for light dosing with 4, 6 and 8 bit per pixel modulation depth
- Comprehensive DMD triggering modes
- Wide range of light sources - LEDs, lasers and arc lamps
- Long lifetime and low maintenance
- Supported by SDK and 3rd party software packages with flexible API support and OEM capabilities

Benefits

- 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

Real Time Parallel Illumination of Multiple Regions

Andor's Mosaic3 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 Mosaic3 suitable for many dynamic applications including bleaching, uncaging, photo-switching, optogenetics and constrained illumination. Mosaic3 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.

Mosaic3 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 can be delivered by LEDs.

2) Small field models

Matches the EMCCD iXon series cameras and are suited to applications including bleaching and uncaging where higher power densities delivered by lasers are required.

Duet option[•6] - Dual DMD-illumination ports for simultaneous two-color, programmable photo-stimulation/imaging. For example, regions of interest can be illuminated with an excitatory wavelength and the remaining field with a second inhibitory or imaging wavelength.

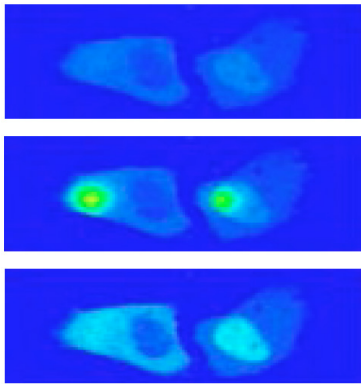
The on-board memory allows for sequences of patterns to be defined and executed with real-time accuracy under software control or following external trigger signals for ultimate experimental flexibility. A unique feature of the Mosaic family is the greyscale functionality for region-specific illumination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

Key Specifications[•2]

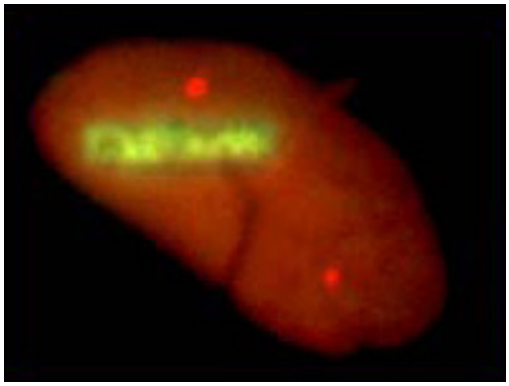
Transmission	**360 nm to 800 nm**
Minimum Exposure Time	**50 µs – 200 µs (Trigger mode dependent)**
Maximum frame rate	**5000 fps (Trigger mode dependent)**

1 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. Mosaic3 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).

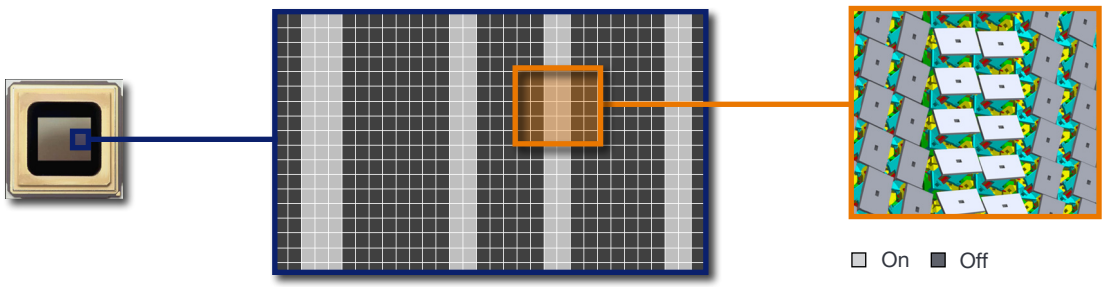


Photoactivation of pa:GFP-histone in U2OS nuclei lights up histones green in a linear region. This technique can be used to study histone mobility within the nucleus, in response to agonists and relative to other nucleoli or other compartments.

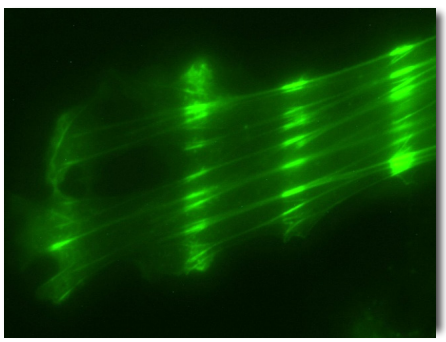
2 DMD Technology

The core of Mosaic3 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 Mosaic3 can be switched “on” or “off” to create the required illumination mask for the image. Example application image shown below:



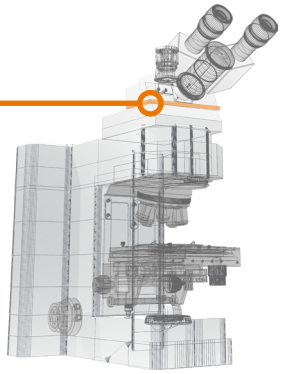
Left: Simultaneous multi-region photoactivation of GFP labelled actin in fibroblast.

3 Mosaic3 Model Guide

There are 2 models of Mosaic3 for **upright** and **inverted** microscope types*:

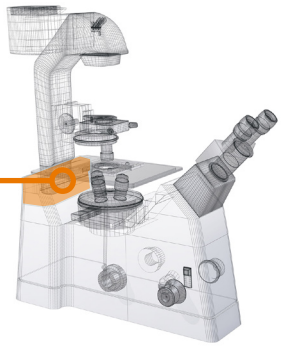
A **Mosaic3** for **Upright** Microscopes

The **Mosaic3** inserts between the epi-illuminator and trinocular head of **upright** microscope models.



B **Mosaic3** for **Inverted** Microscopes

Mosaic3 uses the microscope's epi-fluoresecent port of **inverted** microscope models.



4 Standard or Duet

A Standard option

- Provides illumination within the target region(s).

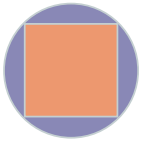
B Duet option

- The Duet features dual-illumination ports which enables illumination of both the target region(s) and the complimentary area outside the target region(s).
- Available on all models apart from large FOI variant for inverted microscopes.

5 Power Density and Field of Illumination*[4, 5]

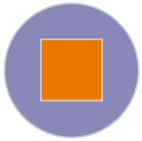
A Large field models

- Provides illumination to fill most of the microscope field and matches the FOV of an sCMOS camera e.g Andor Zyla.
- Large field models are commonly used for applications such as optogenetics where **lower power densities** can be delivered by LEDs.



B Small field models

- Provides illumination within a smaller field. Matches the iXon 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 configuration**

6 Technical Specifications[•2]

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 µs
External Trigger Rising Edge to Exposure Delay	< 200 µs
Minimum Exposure Time Accuracy	+/- 1 µs for all defined exposure times
Minimum Exposure Time Jitter	+/- 0.2 µs

Illumination Sources

Mosaic3 Illumination Ports	Up to 2 ports on both LHS and RHS[•7]
Lamp Sources	High Pressure Mercury Lamp XLED LED Light Source CoolLED, pE300, pE100, pE4000 LED
Laser Sources	405 nm and 445 nm Diode Lasers (please enquire for other laser options)

Software Compatibility

Software to control calibration and enable the user to graphically or numerically define the shape and characteristics of the illumination at the target is included.

Andor Mosaic SDK	A software development kit that allows you to control the Mosaic3. Available for Windows (7, 8, 8.1 and 10) 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.

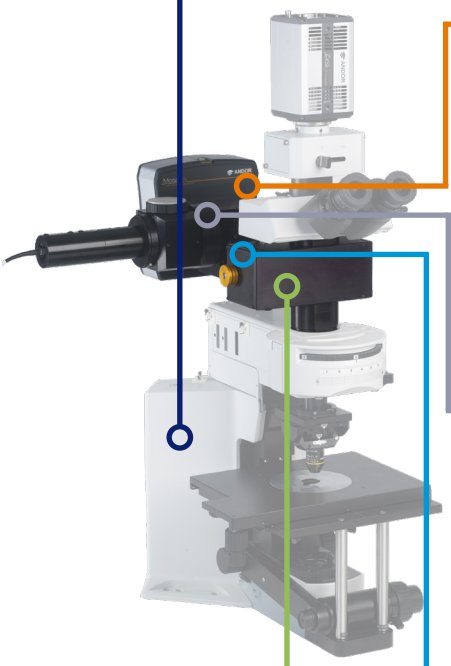
Trigger Modes

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 [•1]	Trigger a predefined sequence of masks.
External Expose [•1]	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 [•1]	Use another device to trigger a predefined sequence of masks.

7 Choosing your Mosaic3 System

An overview of the building blocks required to configure a Mosaic3 system is shown below:

Please discuss your exact application requirements with your customer representative.



A

Microscope Type

Confirm your microscope type

The **Mosaic3** suits many microscopes makes and models. Please specify the microscope details in case there are any requirements specific to your microscope model.

Type	Make	Model
Upright or inverted	e.g. Leica, Nikon, Olympus, Zeiss	Your specific model

B

Field of Illumination

Select your required field of illumination

Description
Large: For large format sensors e.g. iXon Ultra 888, Neo/Zyla or lower power density applications.
Small: For small format sensors e.g. iXon Ultra 897 or higher power density applications e.g. bleaching.

Duet option for Dual DMD-illumination[•6]

Duet: Dual DMD-illumination ports provide simultaneous two colour photo-stimulation/imaging. Available on all models apart from large FOI variant for inverted microscopes.

C

Mosaic3 Light Source

Select the required Mosaic3 light sources

The following **light sources** are available for the **Mosaic3:**

Lasers (including 405 and 445 nm options), **LED** (including 4 and 16 line options) and **arc lamps**.

D

EPI Light Source

Select the Epi light sources (Inverted models only)

The following **light sources** are available for the **Epi input of Inverted models:**

Microscope Specific **Epi lamp** and 3-line **LED** options.

E

Filter Sets

Choose the required filter sets

A wide range of **excitation filters** and **beamsplitter** options are available to suit your application.

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Fax +1 (860) 290 9566

China
Beijing
Phone +86 (10) 8271 9066
Fax +86 (10) 8271 9055

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

Footnotes: Specifications are subject to change without notice

1. Currently available through self-integration using Mosaic3 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)
   Mosaic3 for inverted microscopes:
   Large FOI: 18 to 22 mm (microscope dependent)
   Small FOI: 5.8 to 11 mm (microscope dependent)
   Mosaic3 for upright microscopes:
   Large FOI: 13.6 to 17 mm (microscope dependent)
   Small FOI: 6.8 to 8.5 mm (microscope dependent)
5. All power quoted measured at the output end of a Ø 3 mm, 3 m liquid light guide.
6. The Duet option is available on all models apart from Large FOI variant for inverted microscopes.
7. Dependent on Mosaic3 model.

Minimum Computer Requirements:
- Operating System: Windows 7, 8, 8.1 and 10 32/64-bit.
- Sandy Bridge i5 Processor or better
- USB 3.0 Port or PCI Express x4 slot
- RAM: OS dependent, minimum 4GB recommended

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 [•3]
- Laser radiation is only present in Mosaic systems fitted with a laser. Some Mosaic systems use non laser-based light sources.
- When supplied with a laser source the Mosaic3 is IEC 60825 and CDRH compliant.

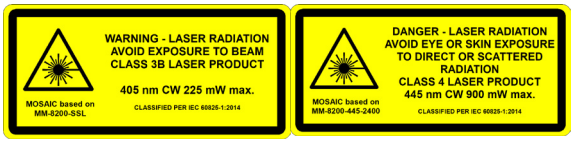
Mains Supply Requirements
- 100 - 240 VAC, 50/60 Hz 1 A max. steady state

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

Mechanical
- Refer to www.andor.com/mosaic

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:



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