OXFORD
INSTRUMENTS

Andor Mosaic 3

Real Time Parallel Illumination of Multiple Regions

Key Features

- ✓ Wavelength range 360 to 800 nm
- ✓ Minimum exposure time 50 – 200 µs
- ✓ Maximum frame rate 5000 fps
- ✓ **NEW** Integrated in Fusion Software
- ✓ Long lifetime and low maintenance
- ✓ Wide range of light sources

Key Applications

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

NEW FEATURE
NOW FULLY INTEGRATED IN FUSION SOFTWARE!
NEW FEATURE

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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:

☐ On   ■ Off
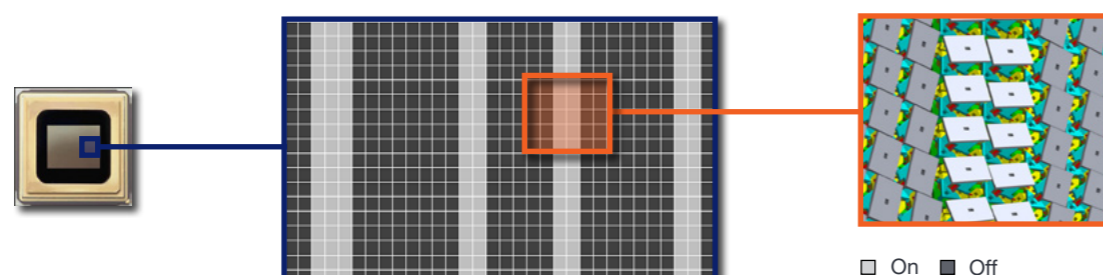
Each tiltable mirror of the 800 x 600 DMD array in the Mosaic 3 can be switched "on" or "off" to create the required illumination mask for the image.
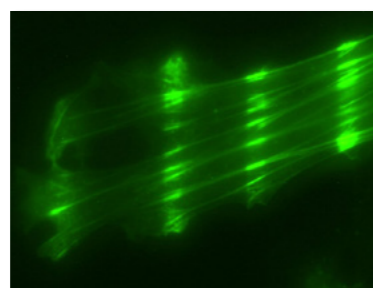
Simultaneous multi-region photoactivation of GFP labelled actin in fibroblast.

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
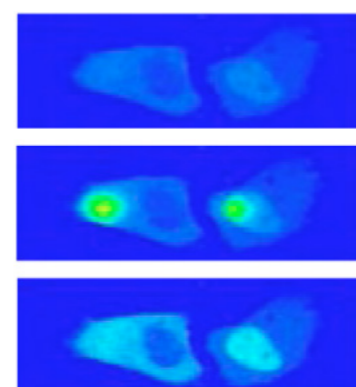
Release of Caged Compounds. Mosaic 3 can be used with UV sources including arc lamps, LED and lasers to uncage biomolecules and render them active (Eder and Bading, BMC Neurosci. 2007; 8: 57).
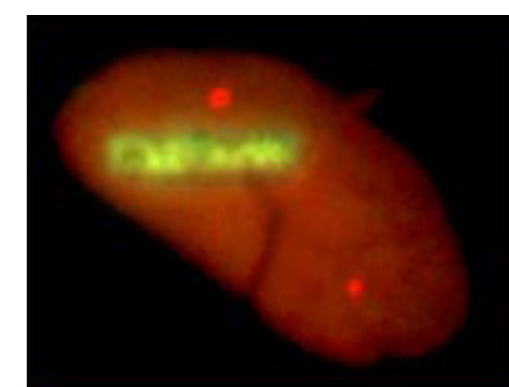
Photoactivation of pa:GFP-histone in U2OS nuclei lights up histones green in a linear region. This technique can be used to study histone mobility within the nucleus, in response to agonists and relative to other nucleoli or other compartments.

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

- ✓ 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.

> **Mosaic 3** uses the microscope's epi-fluoresecent port.
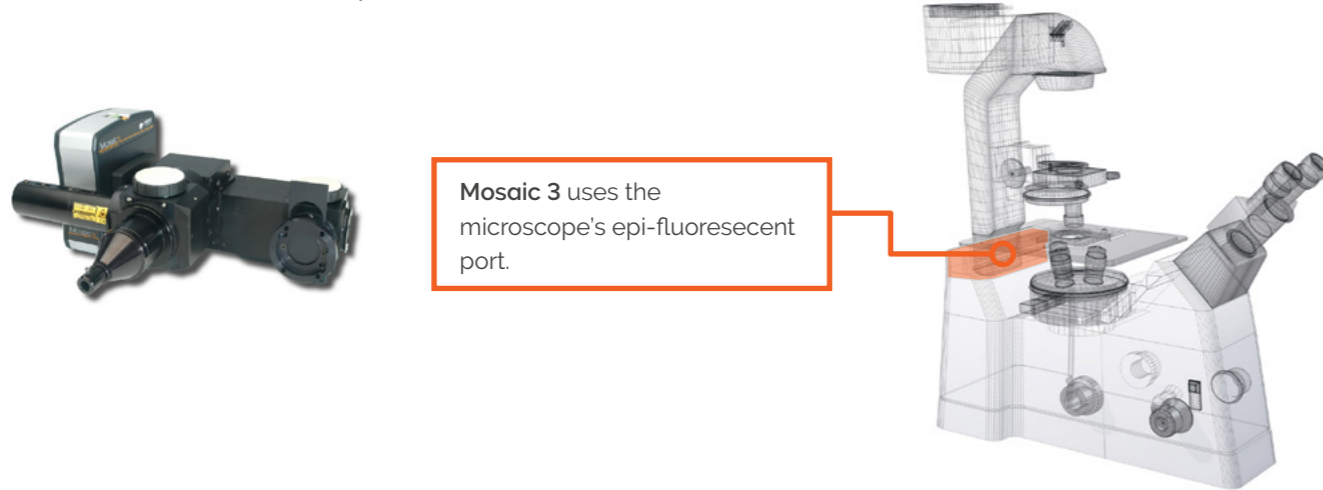
# Power Density and Field of Illumination[4][5]

A   **Large field models**
  ✓ Provides illumination to fill most of the microscope field and matches the FOV of an sCMOS camera e.g Andor 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.
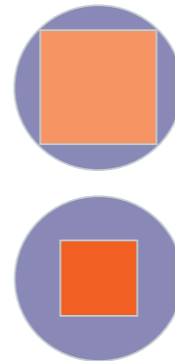
Take Control with Fusion Software

With integration in Andor's Fusion software it has never been easier to run FRAP or optogenetics experiments. Features include:
  ✓ One click automatic calibration
  ✓ Manual trigger – activate at the precise stage in the cell cycle
  ✓ Clear visualisation of photostimulation regions and events
  ✓ Increased productivity – multi-regions simultaneously
  ✓ Data analysis – confirm experiment has worked and analyse in detail off-line

Flexible Control with iQ Software

iQ works in conjunction with your existing acquisition software using iQ's virtual camera.
  ✓ Control routine workflows and components with your usual software
  ✓ Add photostimulation capabilities of the Mosaic under control of iQ
  ✓ Virtual Camera is compatible with all windows-based software (including Windows 11)
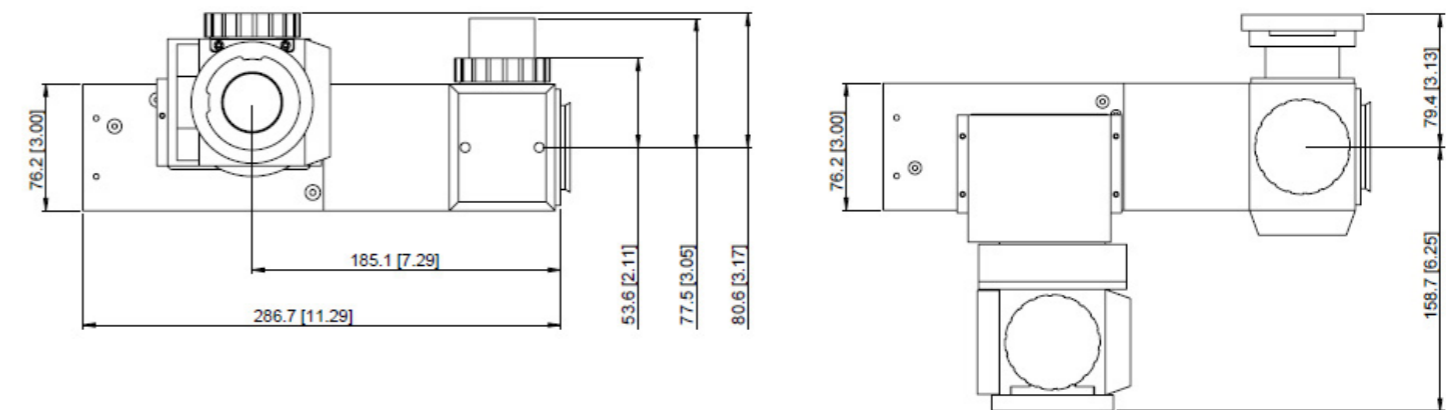 ✓ Full range of functions available through iQ

Product Drawings

Dimensions in mm [inches]

Mosaic 3 Head
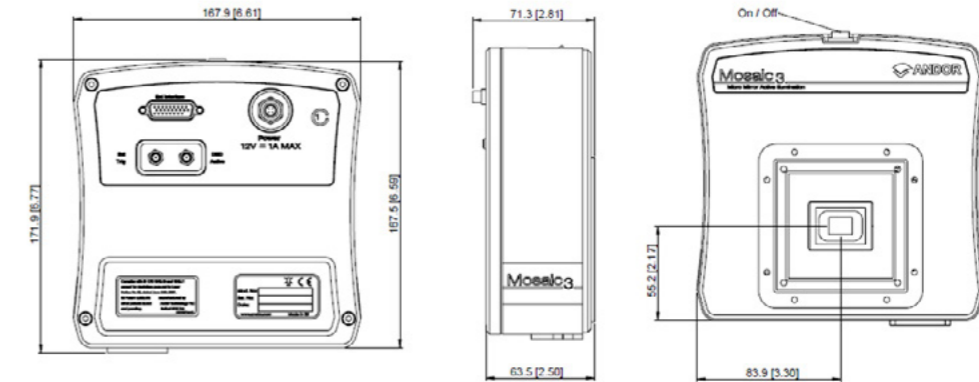
Mosaic 3

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

Mosaic 3 Illumination Ports	Up to 2 ports on LHS for: two lasers/ one laser, one LED / two LEDs.[•6]
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 can now be controlled by our Fusion Software as well as Andor's iQ and 3rd party softwares.

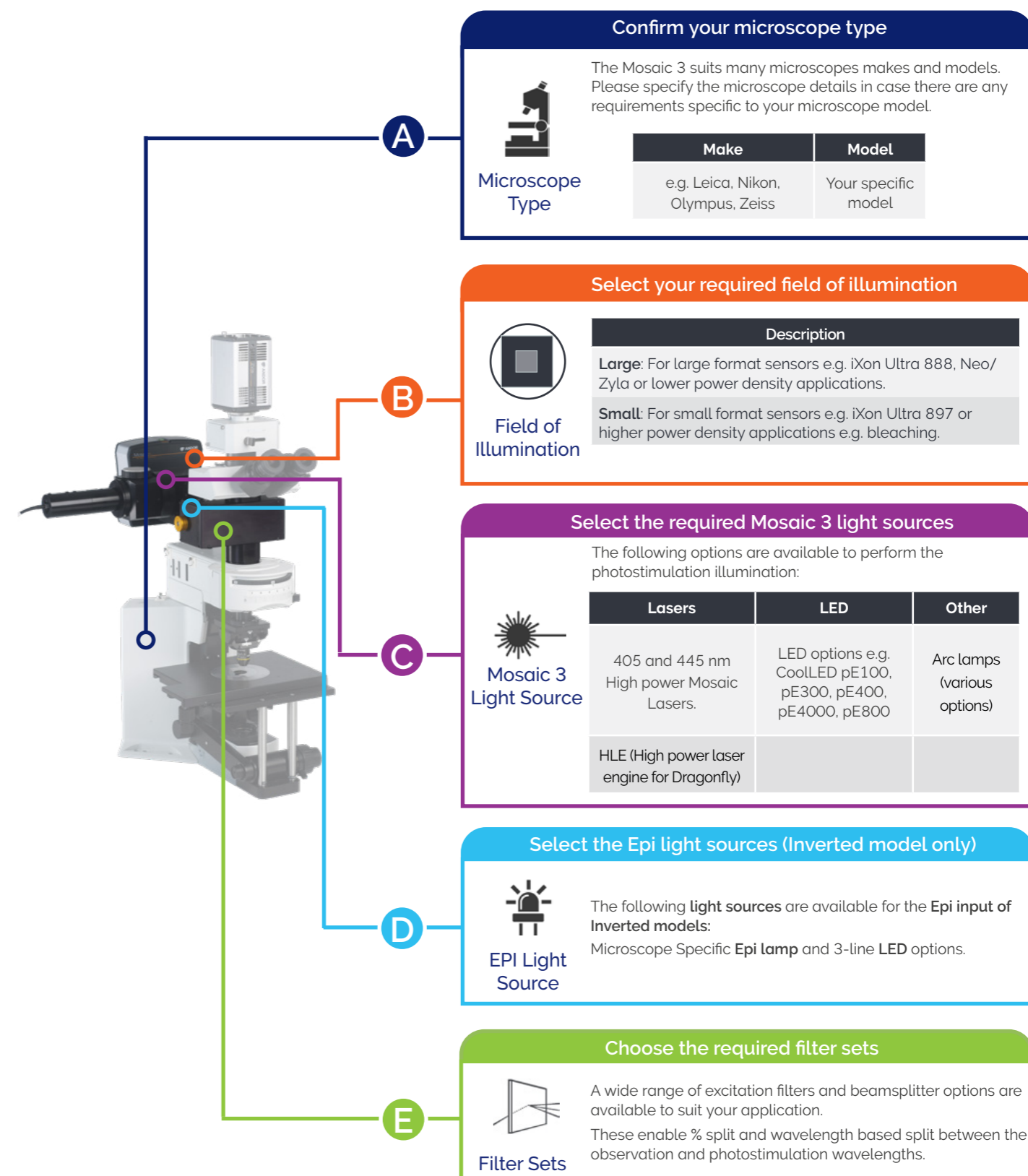|	
Andor Fusion	Fully integrated control of the Mosaic on the dragonfly. Ease of use with features such as one click calibration. Export data for off line analysis.
Andor iQ	Integrate with almost any software using iQ's virtual camera. Use normal acquisition software, with photostimulation functions controlled by iQ.
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.
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.

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.

(A) Confirm your microscope type

The Mosaic 3 suits many microscopes makes and models. Please specify the microscope details in case there are any requirements specific to your microscope model.

Microscope Type

Make	Model
e.g. Leica, Nikon, Olympus, Zeiss	Your specific model

(B) Select your required field of illumination

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.

(C) Select the required Mosaic 3 light sources

The following options are available to perform the photostimulation illumination:

Mosaic 3 Light Source

Lasers	LED	Other
405 and 445 nm High power Mosaic Lasers.	LED options e.g. CoolLED pE100, pE300, pE400, pE4000, pE800	Arc lamps (various options)
HLE (High power laser engine for Dragonfly)		

(D) Select the Epi light sources (Inverted model only)

EPI Light Source

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

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

(E) Choose the required filter sets

Filter Sets

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

These enable % split and wavelength based split between the observation and photostimulation wavelengths.

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**

Our regional headquarters are:

Europe
Belfast, Northern Ireland
Phone +44 (28) 9023 7126
Fax +44 (28) 9031 0792

Japan
Tokyo
Phone +81 (3) 6744 4703
Fax +81 (3) 3446 8320

North America
Concord, MA, USA
Phone +1 (860) 290 9211
Fax +1 (860) 290 9566

China
Beijing | Shanghai | Guangzhou
Phone +86 (400) 678 0609
Fax +86 (10) 5884 7901

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 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.

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 [3]
Laser radiation is only present in Mosaic systems fitted with a laser. Some Mosaic systems use non laser-based light sources.

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:

WARNING - LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT
405 nm CW 225 mW max.
MOSAIC based on MM-6200-SSL
CLASSIFIED PER IEC 60825-1 2014

DANGER - LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 4 LASER PRODUCT
445 nm CW 900 mW max.
MOSAIC based on MM-6200-445-2400
CLASSIFIED PER IEC 60825-1 2014

bsi ISO 9001 Quality Management FM40523

bsi ISO 14001 Environmental Management EMS91062

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