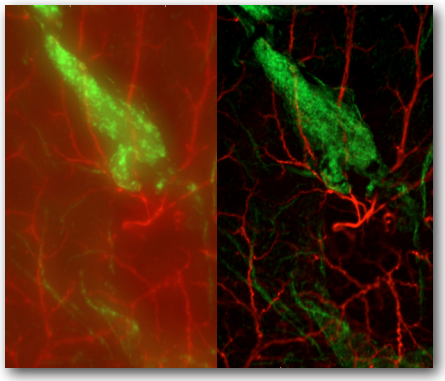


Above: Maximum intensity projections of 3D image set. Widefield image (left), Confocal image (right)

Simply Confocal

Laser-free Confocal Device

Features and Benefits

- **Exceptional confocality**
  Delivers images of high contrast with high dynamic range for outstanding results. Even with thick samples.
- **Full spectrum, laser free**
  370 – 700nm excitation•2
- **Cost effective**
  Easy alignment and low maintenance
- **Confocal flexibility**
  Three confocal sectioning modes to address all magnifications and provide freedom to select best match for sample
- **Large field of view (7.8 x 13.9 mm)**
  Image large samples or larger numbers of cells to increase productivity
- **Real-time control and viewing**
  Switch viewing mode between widefield and confocal with one mouse click
- **Microscope agnostic**
  Simple addition to most microscope models, and even Macroscopes
- **Speed**
  Up to 22 frames per second for live cell imaging
- **Sealed Spinning Disk Unit**
  Insensitive to ingress of dust and debris

High Performance Confocal Module

The Andor Revolution DSD2 is a simple confocal device delivering extra-ordinary imaging performance. Its simplicity lies in a compact patented optical design and laser-free operation, which provide ease of retrofit, flexible fluorophore selection, low maintenance and inherent safety for users.

Combining structured illumination and spinning disk technologies with high sensitivity high dynamic range Andor sCMOS cameras, the Revolution DSD2 produces image quality that typically exceeds confocal images captured with laser point scanning systems. The DSD2 captures images at high frame rates increasing productivity when imaging both fixed and live samples.

With three confocal sectioning options, the DSD2 allows the user to trade optical sectioning with signal level and handles a broad magnification range and sample types from single cell to very thick specimens such as Drosophila embryos and Zebrafish. The DSD2 can even be used with Macroscopes for larger specimens. This new design can image conventional transmitted light contrast techniques (e.g. phase contrast and DIC) to be combined with the confocal image.

Key Specifications•1

Imaging	**4 filter cube positions**
Excitation range•2	**370 – 700 nm**
Emission range	**410 – 750 nm**
Frame rates (max)	**22 fps (16-bit, confocal mode, full frame, 1x1 binning)**
Confocality (PSF)•3	**3 sectors provide 1.2 µm, 1.0 µm, 0.8 µm (FWHM)**

SD-SIM in more detail

In a DSD system, the spinning element comprises a single synthetic quartz disk supporting a thin layer of coated aluminium in which the Structured Illumination Pattern (SIP) is created by photo-lithography. The Aluminium SIP has a 1:1 mark to space ratio (half metal and half space), which means that approximately half of the light falling upon it is reflected (R) and half transmitted (T). This is true for light which is incident from either side of the disk and is a critical feature of the device. Figure 1. below illustrates the three patterns on the DSD disk: These represent the high-sectioning (fine), good sectioning and signal (medium) and high signal (coarse) confocal modes.

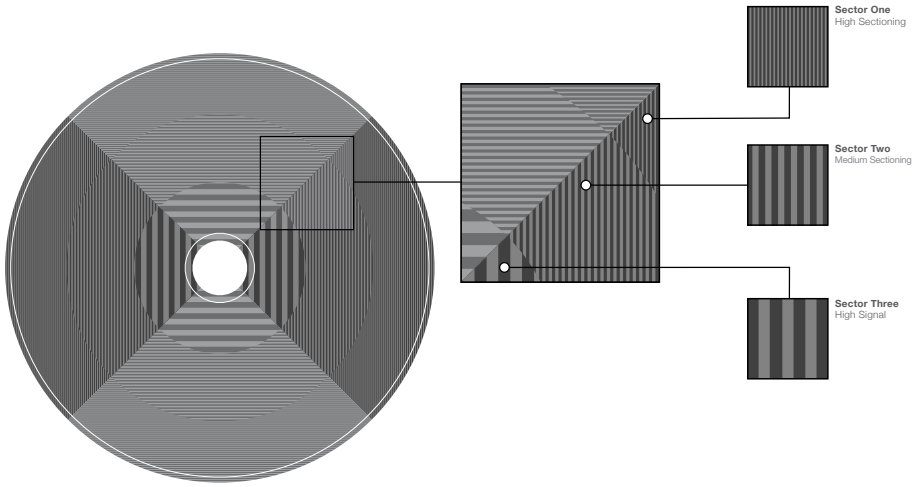


Figure 1. The differential spinning disk is manufactured with three structured illumination patterns: High-sectioning (fine), medium sectioning (medium) and high signal (coarse) confocal modes.

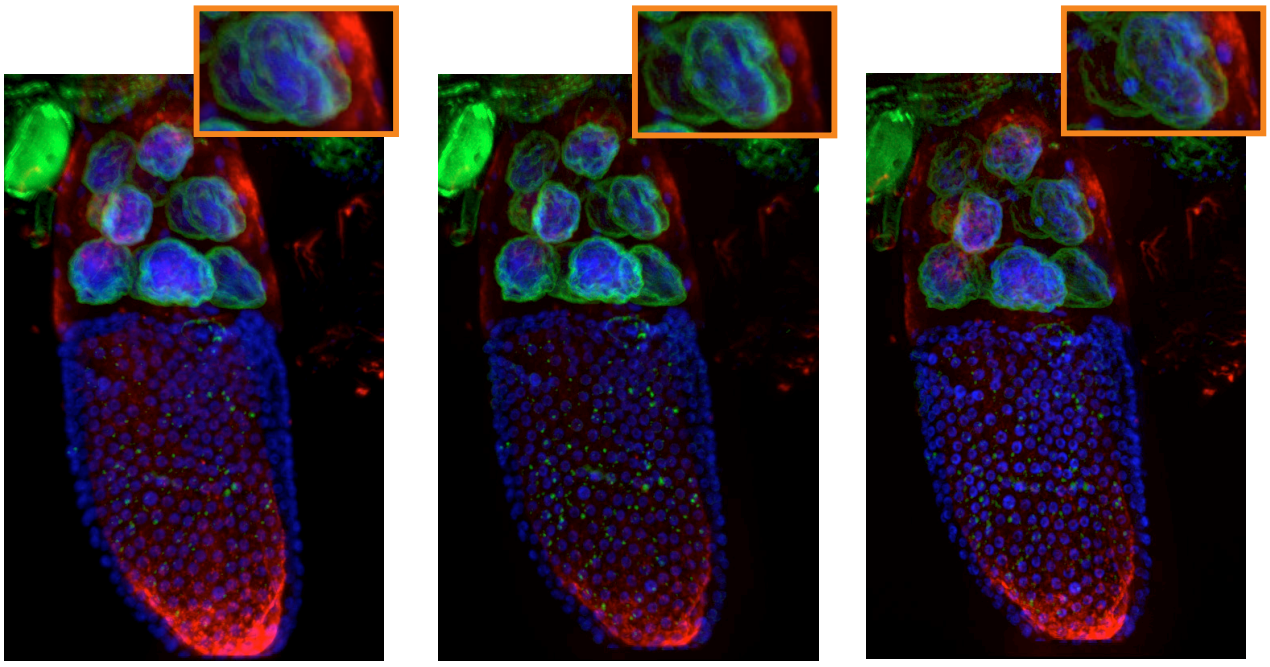
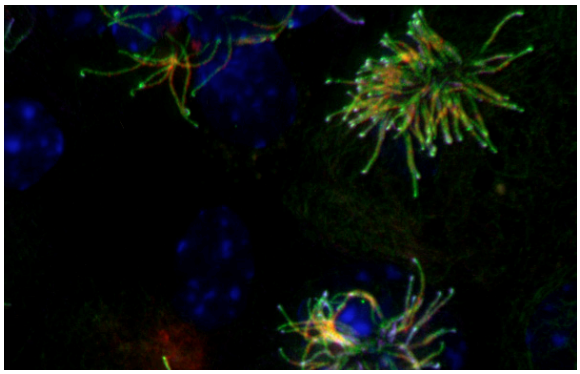


Figure 2. Images of the same sample taken using the three different disk sectors. Sample is the egg-chamber from Drosophila melanogaster at stage 10. Visible is the large oocyte with its tiny meiotic nucleus. Insets are a close-up of the nurse cells with large polyploid nuclei. You can see the improved resolution as the disk pattern moves from High signal to High sectioning. Stained are: DAPI (blue) to show the DNA, WGA-657 (green) to show membranes, primarily visible are nuclear membranes. Also stained by fluorescent in situ hybridization is the oskar mRNA that is enriched at the posterior cortex . Detection: Cy3-coupled tyramide amplification. Captured using 20x objective with 0.8 numerical aperture. *Courtesy of Dr Helena Jambor (of Tomancak Lab) at MPI Dresden.*

Applications

- Immunofluorescence (3D structure and visualization)
- Development e.g. *C. elegans*, Zebrafish and Drosophila
- Embryology
- Stem Cell & 3D cultures
- Neuroscience
- Cell Dynamics
- Cellular Biochemical Imaging, e.g. Ca^{2+} (not Fura2) & pH
- Motility and Chemotaxis Assays
- Photo-Manipulation e.g. activation, ablation & optogenetics



Above: Cilia labelled in ependymal cells with tubulin antibodies by indirect immunofluorescence1) Acetylated tubulin (cilia labelling)/ Alexa 4882) Détyrosinated tubulin (cilia labelling)/ Cy33) Tyrosinated tubulin (cilia labelling in pseudo color magenta)/ Cy54) Cell nuclei stained with Hoescht.
Courtesy of Dr Saoudi, GIN, Grenoble.

Specifications[•1]

Interfaces

Camera-Computer Interface	USB 2.0, 3.0 and Camera Link
Microscope Interface	Microscope specific image port adapter (see compatible microscopes)
Light guide core diameter	3 mm

Optical

Operating Principal	Structured illumination, spinning disk. 3 grid densities for matching sectioning and throughput to objective and sample	
Disk rotation speed	3000 rpm	
Minimum Exposure	20 ms (1 full disk rotation)	
Exposure Increment Value	20 ms (for optimal image stability)	
Disk Sector 1 – High Sectioning	Axial PSF (@ 60x 1.4 NA)	0.8 µm
Disk Sector 2 – Good Sectioning / Signal	Axial PSF (@ 60x 1.4 NA)	1.0 µm
Disk Sector 3 – High Signal	Axial PSF (@ 60x 1.4 NA)	1.2 µm
Widefield By-pass	Selectable mode completely removes disk from the imaging path	
Switching time between disk sectors	<3 s	
Filter Cubes Turret	4 positions, user-replaceable cubes (designed for DSD2 & factory aligned)	
Filter switching time	<200 ms	

Compatible Cameras

Cameras	Description	Confocal Image Dimensions
Andor Zyla 5.5	5.5MP sCMOS, 3-tap Cameralink or USB, C-Mount	1159 x 2118 pixels, 6.5 µm pixel size
Andor Zyla 4.2	4.2MP 4T sCMOS, 10-tap camera Link, C-Mount	928 x 2040 pixels, 6.5 µm pixel size
Andor Neo	5.5MP, -40°C Vacuum Cooled, C-Mount	1159 x 2118 pixels, 6.5 µm pixel size

Compatible Microscopes[•5]

Olympus BX[•4]/IX2/3	BX2/BX3 upright, IX2/IX3 inverted
Nikon TiE/ TiU	Ti Eclipse range inverted microscope
Nikon TE2000	TE2000 inverted microscop
Nikon FN-1 (LV-TI3 TriNoc Tube)[•4]	FN-1 upright microscope with LV-TI3 TriNoc (NOTE: LV-TV Adapter not required)
Nikon FN-1 (C-TT TriNoc Tube)[•4]	FN-1 upright microscope C-TT TriNoc (NOTE: Y-TV Adapter not required)
Nikon NiE/U Quadnocular[•4]	NiE/U upright microscope Quadnocular
Nikon NiE/U Trinocular[•4]	NiE/U upright microscope Trinocular image port adaptor (NOTE: Y-TV Adapter not required)
Nikon SMZ25[•4]	SMZ25 Upright Microscope (18.5 mm offset)
Leica DM[•4]/DMI Range	DM/DMI 4000 to 6000 upright[•4]/inverted microscope
Leica MacroFluo[•4]	MacroFluo upright macroscope
Zeiss AxioVert / Observer[•4]	AvioVert and Axio Observer range inverted microscope
Zeiss Axio Imager	Axio Imager range upright microscope

Compatible Light Sources

Andor AMH-200-FS6	High output Metal Halide Light Source with motorized 6 position filter-wheel and shutter, USB Control Uses matched pre-filters for optimum background suppression
Other Metal Halide source	Minimum requirement of 3mm diameter light guide (e.g. X-Cite, Intensilight, EL6000)
LED	Under investigation

Filter Cube Options*

Filter Cube	Filter Specifications	Typical Flurophores
DAPI	390/40 Ex, 405 DM, 452/45 Em	DAPI, Hoechst, AMCA
GFP / FITC	482/18 Ex, 488 DM, 525/45 Em	GFP, FITC, Alexa 488
RHO-B	531/40 Ex, 562 DM, 593/46 Em	Rhodamine B, Alexa 555
RFP / DsRED	561/14 Ex, 561 DM, 609/54 Em	RFP, DsRed (not dimer2), TRITC
mCH	583/22 Ex, 594 DM, 631/36 Em	mCherry, Texas Red, Alexa 594
Cy5	640/14 Ex, 635 DM, 676/29 Em	Cy5, Alexa 647
Quad	390/482/563/640	DAPI, FITC/GFP, TRITC/RFP, Cy5

* Other filters can be specified

Supported Software

Package	Feature	Specification
Andor iQ 3.1	Online Confocal Processing	Confocal frame rates of up to 22fps in streaming mode 8fps in synchronised mode
	Offline confocal processing	Permits highest capture speed of camera.
	6D User interface	Simple setup of multi-channel, z-scan, time-lapse at multiple fields of view
	Instant widefield-confocal switching	Easy live scanning of specimens in widefield mode to find sample
	Automatic instrumental background correction and calibration	Optimised image quality and easy to maintain alignment.

Customised Workstations

DSD2 Workstation	High Performance PC with 3.7 GHz Quad Core processor, 2 GB Graphics Card 16 GB RAM, 256 GB SDD + 2 TB RAID 0 Image Disk, no monitor, iQ Core included	Andor customized workstation optimized for fast online DSD2 processing and large image disk
DSD2 Workstation with Imaris	High Performance PC with 3.7 GHz Quad Core processor, 3 GB Graphics Card, 32 GB RAM, 256 GB SDD + 2 TB RAID 0 Image Disk, no monitor, iQ Core and Imaris core included	Andor customized workstation optimized for fast online DSD2 processing and large image disk with improved RAM and GPU for Imaris rendering and large data set handling

Creating The Optimum Product for You

How to customize the Revolution DSD2[•5,6]:

Step 1.
Select the DSD2 Core system.

Step 2.
Select the filters required for your application.

Step 3.
Choose the microscope model to select the corresponding port adapter (See Microscope Compatibility Table for more detail of supported microscopes).

Step 4.
Select the the appropriate objective scanning option for your microscope.

Step 5.
We also offer high performance solutions for photo-ablation, uncaging, switching and FRAP. Please contact us for a detailed specification and quotation.

RD-DSD2- Core

Step 1.

Select the DSD2 Core system.
Includes DSD2, Camera (typically USB 3.0 Zyla 5.5), light source and iQ Workstation

Step 2.

Select the appropriate filter from the table below:

Fluorophores	Part Number
DAPI, Hoechst, AMCA	RD-DSD2-DAPI
GFP, FITC, Alexa 488	RD-DSD2-GFP
Rhodamine B, Alexa 555	RD-DSD2-RHO-B
RFP, DsRed (not dimer2), TRITC	RD-DSD2-RFP
mCherry, Texas Red, Alexa 594	RD-DSD2-MCH
Cy5, Alexa 647	RD-DSD2-CY5
Quad Set (DAPI, FITC/GFP, TRITC/RFP, Cy5)	RD-DSD2-QUAD

Step 3.

Identify microscope model for relevant port adapter:

Model	Part Number
Leica DM, DMI, MacroFluo	RD-DSD2-MA-LEICA-X
Nikon Ni, FN-1, TE2000, TiE, SMZ25	RD-DSD2-MA-NIKON-X
Olympus BX & IX	RD-DSD2-MA-OLYMPUS-X
Zeiss Axio Vert, Observer, Skop, Imager, Examiner	RD-DSD2-MA-ZEISS-X

X= to be qualified by your Andor Representative (see compatible microscopes)

Continued on page 6.

Continued from page 5.

Step 4.

Internal motorized focus control supported by Andor iQ.
Select your required scan option from the table below:

Focus Choice	Microscope	Part Number
Software supported internal focus control	Leica	State Model
	Nikon	State Model
	Olympus	State Model
	Zeiss	State Model
Motorised control of manual mechanism or automated microscopes not supported by Andor iQ	Leica (not DM1000-3000 or DMIL)	MP-PMFC-LCDMI
	Nikon 80/90i, AZ100, TE2000	MP-PMFC-NKU
	Olympus BX and IX	MP-PMFC-BX60
	Zeiss AxioVert and Observer	MP-PMFC-ZSAV
Objective fast focus drive XXX = 100 or 400 for travel range YY = 25 or 35 thread size	Leica/Nikon	MP-PXXX-OBJ-NKL-MYY
	Zeiss/Olympus	MP-PXXX-OBJ-OLZ-RMS
Stage mounted fast focus drive	Options available for a range of stages (Prior, ASI & Ludl)	Please discuss with Andor Representative

Have you found what you are looking for?

We offer a wide range of other components to enhance your imaging system. Consider state of the art laser engines, EMCCD and scientific CMOS cameras and many others. Please contact your local specialist or visit our website for more information: http://www.andor.com/microscopy-systems

Microscopy components
Specification sheets
andor.com/microscopy-systems

Software

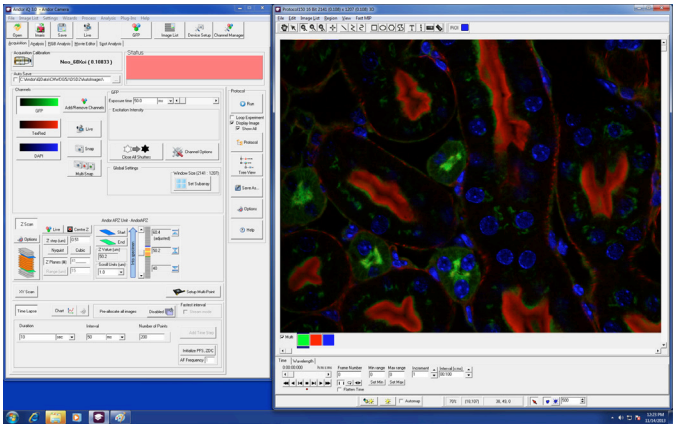
Andor iQ3

Multi-dimensional imaging with Python IDE

Andor iQ is our flagship live cell imaging software. iQ - image and quantify - occupies a central role in our Revolution confocal and Active Illumination product range. iQ provides optimized control of Andor's award winning iXon EMCCD and sCMOS cameras in synchronized combination with a number of additional imaging hardware devices, addressing a range of bioimaging applications. Use iQ to run experiments to investigate dynamic processes in single cells through to multi-cellular systems, perform routine imaging of fixed samples, and generate 3 dimensional image volumes for analysis.

Features

- User-controlled acquisition of confocal, wide field or both images from DSD
- Multidimensional at its core - from time-lapse to 4D multi-channel imaging
- New 6D user interface for rapid setup and tuning
- User management – per user settings and image storage
- Integration with Imaris for fast image transfer and subsequent 3D analysis
- Multi-field & montage capability for large specimens or increased throughput
- "Flexible Protocols" for advanced routines
- Dedicated Active Illumination device control – Ablate, Bleach, Activate



Imaris

The Ultimate Tool for Visualisation and Analysis of Multi-Dimensional Images

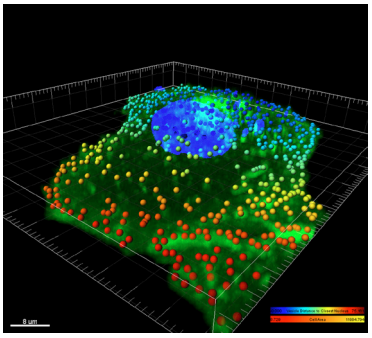
Imaris delivers all the necessary functionality for visualization, segmentation and interpretation of multidimensional datasets.

By combining speed, precision and intuitive ease-of-use, Imaris provides a complete set of features for handling multi-channel image sets of any size up to 50 gigabytes.

Imaris will read, visualize and analyze images acquired from almost any confocal and wide field microscope. Imaris and iQ have been co-designed to provide seamless ImageDisk access for Imaris 7.1 and above, avoiding the tedious save/open cycles required for third party data. Imaris has been specifically designed to target the critical data processing needs of the most demanding life-science imaging applications. Its intuitive workflow approach takes away the need to select and manage a range of imaging tools and frees the scientist to get on with their research.

Features

- Advanced Volume Rendering - Maximum Intensity Projection (MIP), Blend Projection and Real-Time Shadow Rendering
- Surfaces, Segmentation and interactive Iso-Surfaces, Region Growing and Semi Automatic Surface Generation
- Spots, Segmentation and Interaction - Identify and interact in 3D with hundreds of objects
- Smart Handling of Huge Images > 50 GB
- Multi-threading & Advanced Computer Graphics - High-resolution, multiple light sources and 3D holographic rendering
- Module packages available for Cell Biologists and Neuroscientists.



Core Features

- Fast data exchange with Andor iQ
- Exceptional volume and surface rendering visualisation

Optional modules available including:

- Interactive and automatic measurements in x,y,z and time
- Feature segmentation and tracking options.
- Neuroscience package including filament tracing
- Extensible via Imaris XT modules available from the user community

Mechanical

Core System Dimensions (WxDxH) – including Zyla Camera	456 X 220 X 135 mm
Core System Mass (including Zyla camera)	6.9 kg
Camera Mount Load Capacity	2 kg
Optical Path Height Adjustment Range	74 – 114 mm
Lockable to Optical Table	Yes, DSD2 clamp kit and camera support and clamp kit included, M6 and ¼" UNC bolt compatible
Alignment Degrees of Freedom Relative to Microscope	Adjustable Pitch and Yaw at microscope coupling, lockable in both axis
Mounting Orientations	Suitable for Left Hand or Right Hand imaging ports of Inverted Microscopes or for upright mounting onto Upright Microscopes* (See Compatible Microscope List)

Storage and Transportation

Ambient Temperature	-20 to +50°C
Relative Humidity	20 to 75% at +35°C
Air Pressure	800 to 1060 mbar

Operating Environment

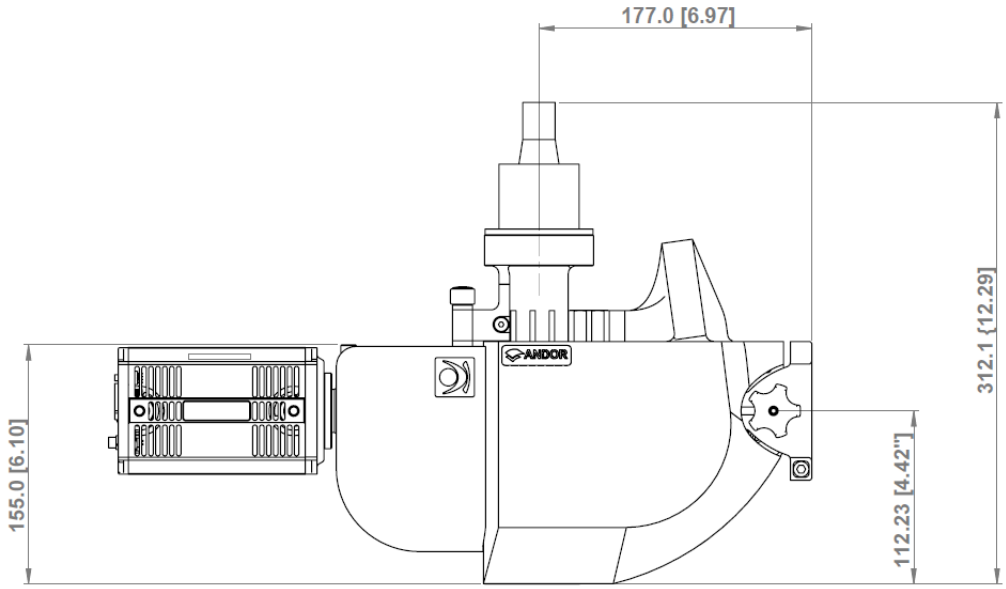
Ambient Temperature	+10 to +35°C
Relative Humidity	20 to 75% at +35°C
Air Pressure	800 to 1060 mbar

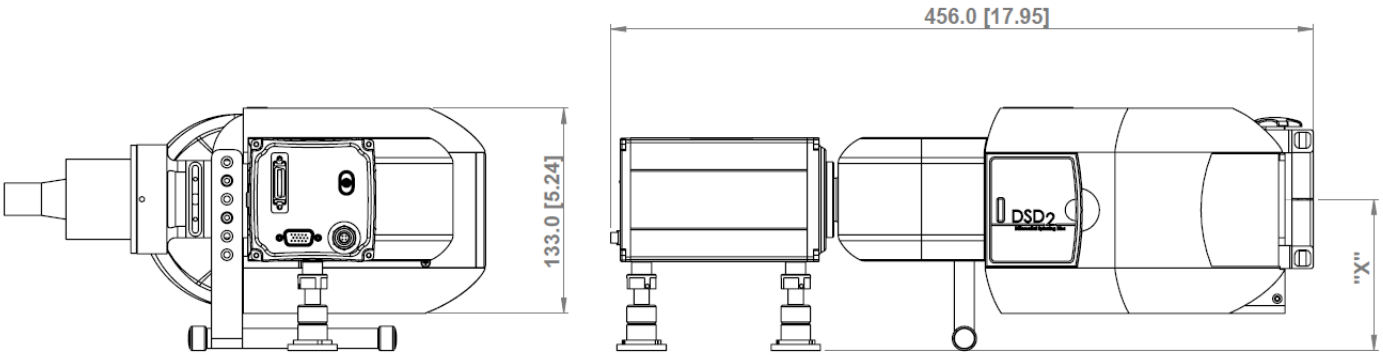
Electrical

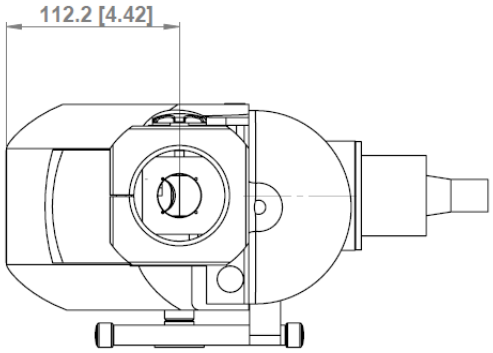
Power Supply	External Power Supply, Mains fed
EPS Input Voltage	100 to 240 V AC (±10%), self-sensing
EPS Input AC Frequency	50 to 60 Hz
Device Voltage	12V DC
Device Current (Peak)	12.5 A
Supplied Power Lead Socket	IEC 60320/C14 (3 Pin)
Short Circuit Protection	Continuous

Product Drawings

Third-angle projection







Notes

"X" is adjustable within the range 74.0 [2.91] to 110.0 [4.33]

Dimensions in mm [inches]

DSD2 shown with Zyla Camera attached

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 regional sales offices, please see: andor.com/contact

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

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

Items shipped with your system:
DSD2 Unit (with choice of filters)
Zyla sCMOS camera
AMH Light Source
iQ Imaging workstation (with Imaris if chosen)
Microscope adapter (model specific)
Optional z-control (as required)
System accessories as ordered
(Please ask your Andor Sales Representative)

Footnotes: Specifications are subject to change without notice

1. All Specifications are correct at the time of writing but may be subject to change without notice.
2. Excitation range subject to side port and objective spectral transmission.
3. Using 60 x 1.4 oil immersion objective lens.
4. Upright microscopes must be secured to the workbench to meet European safety requirements. A pre-drilled optical table surface is ideal. Kits are supplied to fix to standard bench surfaces but this requires drilling and fixing into the bench material
5. Systems may be customized to your specific requirements past the standard product offering through the Andor Customer Special Request (CSR) system. Please ask your Andor Sales Representative if you would like an assessment and quote for a customized configuration
6. If your preferred microscope is not listed, please enquire.

Minimum Computer Requirements:
• Please ask your Andor Sales Representative

Operating & Storage Conditions
• Operating Temperature: +10°C to +35°C ambient
• Storage Temperature: -20°C to +50°C ambient
• Relative Humidity: 20 to 75% at +35°C (non-condensing)

Power Requirements
• 100-240V AC (±10%), 50-60 Hz

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