



Product Information  
Version 1.1

## **ZEISS Axio Observer**

Your Open and Flexible Inverted Microscope Platform



# Your Open and Flexible Inverted Microscope Platform

- › **In Brief**
- › The Advantages
- › The Applications
- › The System
- › Technology and Details
- › Service

In life sciences research you come up against new challenges every day – challenges that call for reproducible data from a whole range of samples in a variety of conditions. That’s why you want a flexible microscope system that can be tailored to your needs and offer you lots of interfaces and extensions. Axio Observer is your stable inverse platform for demanding multimodal imaging of living and fixed specimens. It uses the latest generation of LED illumination for gentle imaging. And creates the optimal environment for a whole range of samples to deliver reliable, reproducible data. You can combine it with a wealth of technologies and refine it to support your experiments precisely, choosing from a broad portfolio of options.



# Simpler. More Intelligent. More Integrated.

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

## A Flexible Platform

Depending on the scientific question at hand, you often have to combine complementary imaging modalities to get the data you need.

The Axio Observer platform offers an abundance of interfaces for technologies ranging from widefield transmitted light to convenient 3D sectioning with Apotome.2, and sensitive super-resolution imaging with LSM 880 and Airyscan.

You can choose classic micromanipulation and cell injection, or sophisticated laser microdissection. Simply select the ideal cameras from a broad range of dedicated Axiocams or from third party microscope cameras: you will always get the image quality, required speed and sensitivity you need for your applications.

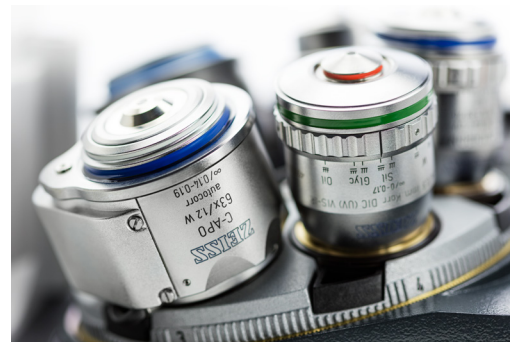


## Remarkably Efficient

Give your research the benefits of Axio Observer's many automation features. Whether keeping your sample in focus for longterm time-lapse imaging or adapting your objective to your sample, it's all automatic with this highly organized system.

You'll be amazed how easy it is to perform your imaging when your microscope finds the focus of the sample for you – and keeps it there.

Expect a significant boost in efficiency and throughput with Axio Observer.



## Open for Future Applications

Life sciences research is a dynamic environment in which your imaging requirements are always changing. As your needs grow, Axio Observer stays with you step by step. It delivers all common contrast methods available with highest image quality. Choose the optimal incubation equipment and enjoy easy access to the sample for precise micromanipulation. Use fast, switchable LEDs or go for powerful and economic white-light sources in combination with fast filters. Such a great variety of integrated options makes your Axio Observer both versatile now and entirely future-proof. With well-documented hardware and software interfaces to create your own customized system.

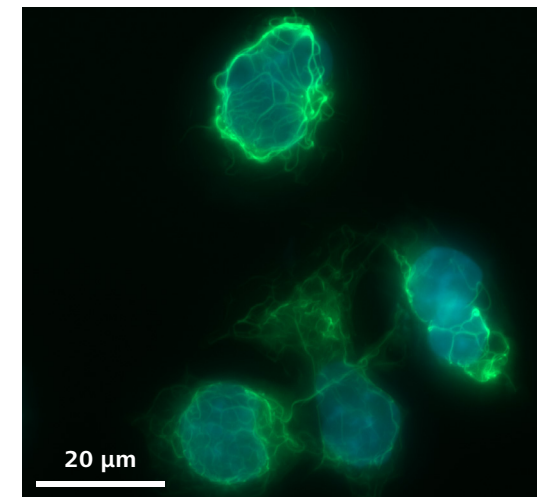
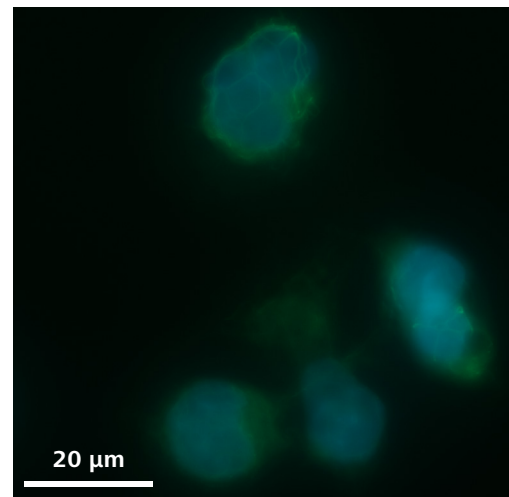


# Your Insight into the Technology Behind It

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

## Get Better Images – With Autocorr Objectives

It takes the very best objectives with a high numerical aperture to image subcellular structures. But the wide opening angle of these objectives makes them especially susceptible to spherical aberrations. This physical effect is caused by the different refractive indices and interfaces in both the optical system and the sample. With the introduction of Autocorr, your Axio Observer now supports a new generation of objectives. With Autocorr you adjust the optics of your microscope to your sample, with a simple slider in ZEN imaging software. Expect crisp contrast even deep inside in your specimen. And much more efficient fluorescence detection so you will get better data while less excitation intensity will improve the viability of you samples.



SK8 K18 mouse cells. Vimentin stained with Alexa 488 (green), nuclei stained with DAPI (blue). Left image without correction of cover slip thickness, right with applied correction.

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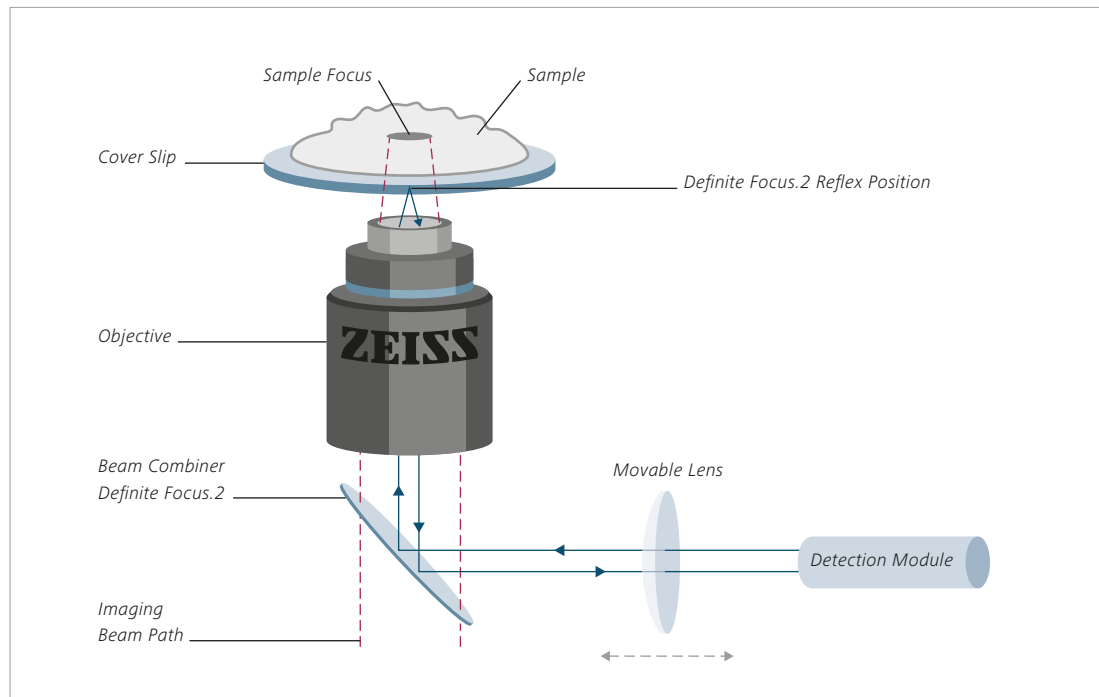
- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

## Keep a Sharp Eye on Your Goals – with Definite Focus.2

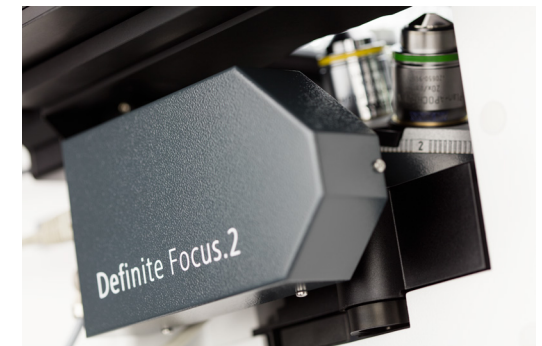
Acquiring time-lapse data from living samples can be tricky. Changing conditions such as room temperature influence the microscope as well as the sample carrier and can cause focus drift. Definite Focus.2 compensates for this drift and keeps your samples in focus – even during your most challenging multiple day, multi-position time-lapse experiments.

Here's how it works: an infrared LED is projected through a grid onto the bottom of the sample carrier. Any change in the focal position of the sample will be indicated by a change of the grid image on the carrier bottom. An integrated camera monitors the shift while the focus drive of the stand moves to compensate for the drift in real-time. Using ZEN imaging software, simply

choose a focus strategy and set up your experiment: all compensation happens automatically in the background, without interfering with your acquisition.



Schematic beam path of Definite Focus.2



Definite Focus.2 is integrated into the nosepiece of your Axio Observer 7.

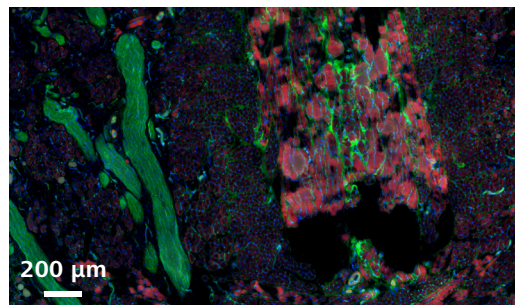
# Your Insight into the Technology Behind It

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

## Perform Advanced Fluorescence Imaging – with Virtual Filters

The rise of fluorescent proteins and other fluorescent markers for specific labeling of cellular or subcellular structures has brought new challenges to microscopy. For a start, no matter which label you use, there must never be too much dye if you want to achieve unbiased imaging. But less dye means less signal so you will need a very light-efficient detection system to acquire all those precious photons of emission light.

Second, depending on the model organism or cell line you are using, you will face many possible spectral combinations. That calls for high spectral flexibility in the fluorescence beam path.



Kidney section. IHC stained with Cy3 (red), anti-GFP antibody stained with Alexa 488 (green), nuclei stained with DAPI (blue).

Third, to observe fast processes in living samples, you need a system that can alter the excitation wavelength rapidly.

To meet these challenges, Axio Observer uses advanced Virtual Filter technology: a double filter wheel for emission filters and dichroics that enables flexible combinations of wavelengths.

Combine it with any white light source and the fast excitation filter wheel or use the unique multicolor Colibri LED light source to get all the benefits of high efficiency filters, full spectral flexibility, high excitation intensity and extremely fast switching times – mostly without any mechanical movement of components.



Virtual filters allow a wealth of excitation and emission combinations for fluorescence imaging.

# Expand Your Possibilities

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

## Use Fast, Gentle and Reproducible LED Illumination – with Colibri 7

Fluorescence microscopy calls for a light source that produces just the right wavelength and enough intensity to excite the fluorescent dyes and proteins in your samples. That makes Colibri 7 with its fast LED illumination system the perfect choice for all your fluorescence imaging.

Narrow-band LED excitation reduces cross-stimulation while increasing the contrast and SNR of your images. Unlike traditional filter-based white light sources, LEDs do not produce a lot of unwanted UV and IR leakage. This greatly reduces bleaching and enhances the viability of your samples.

As the name suggests, Colibri 7 gives you seven individually-adjustable excitation wavelengths.

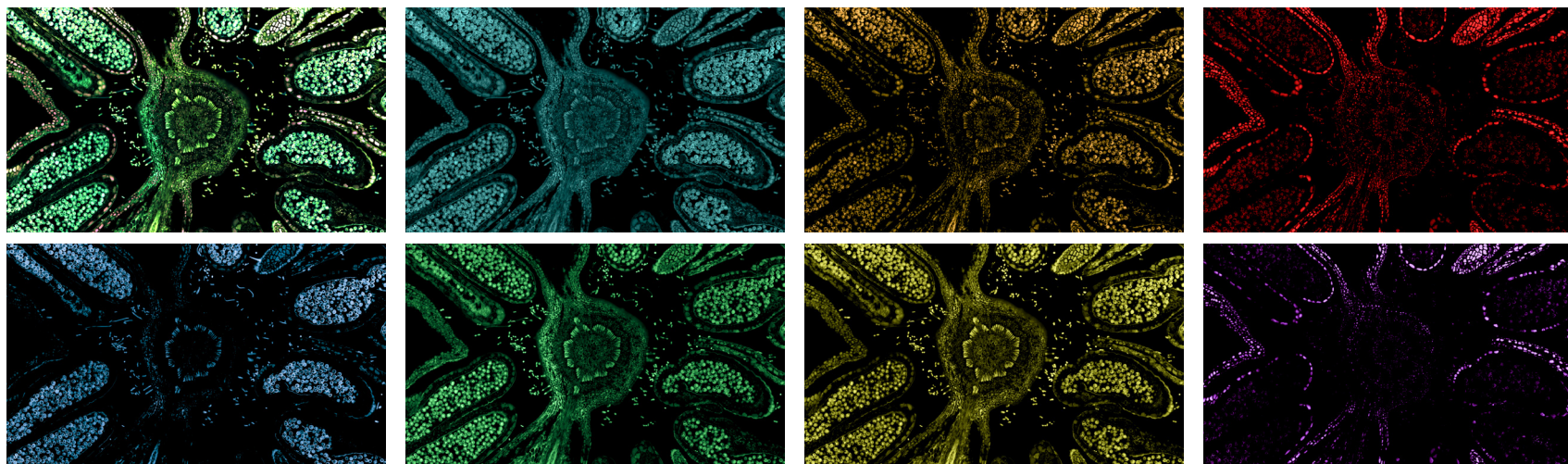
Either control them via the TFT touchscreen of your Axio Observer 7 or use the optional control panel to put the intensity of all the LEDs at your fingertips.

Colibri 7 is fully integrated into ZEN imaging software, giving you the benefit of extremely fast switching times – with precise control of excitation intensities to protect your sample and deliver reproducible results.

Colibri 7 also makes sense both economically and ecologically. LEDs consume approximately 80 % less energy than conventional light sources and they do so over extremely long lifetimes. You will never again have to change metal halide-, Xenon- or Mercury-arc lamp bulbs, so you will save time, save money – and save the planet, too.



*The compact design of Colibri 7 houses up to seven excitation wavelengths. Fast and precise switching of intensities delivers reproducible results.*



*Autofluorescent Hazelnut (male flower) imaged with seven different wavelengths. The first image shows an overlay of all channels.*

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- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

### Open Application Development (OAD) is Your Interface to the ZEN Imaging Software

- Use Python scripts to customize and automate your workflows.
- Integrate external image analysis applications into your workflows.
- Exchange image data with external programs like ImageJ, Fiji, MATLAB, KNIME or Python.
- Use feedback functions for smarter and dynamic experiments
- Get more reliable data in less time.  
It's your choice.



*OAD enables the analysis of data acquired with ZEN imaging software by other programs like ImageJ. Transfer your results back to ZEN for further analysis and display.*



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- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

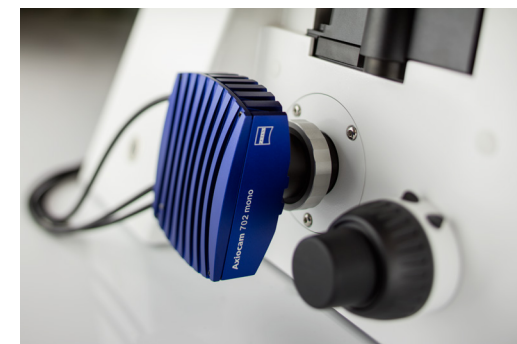
As your needs grow, you can always expand your Axio Observer. The flexible platform concept provides numerous defined and well documented interfaces. Upgrade new accessories from a broad portfolio of ZEISS solutions or third party offerings.



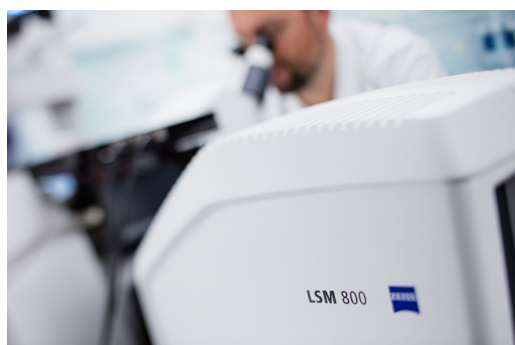
*Choose the right objectives for your application from a broad portfolio of lenses.*



*Use Duolink and ZEN imaging software to perform high speed imaging with two spectrally separated channels simultaneously.*



*Select a microscope camera with the sensitivity, resolution and imaging speed you need.*



*Expand your system with a range of complementary 3D imaging methods.*



*Combine your Axio Observer with stable incubation options for long-term live cell imaging.*



*Use Laser Manipulation with DirectFRAP to analyze fast intracellular processes.*

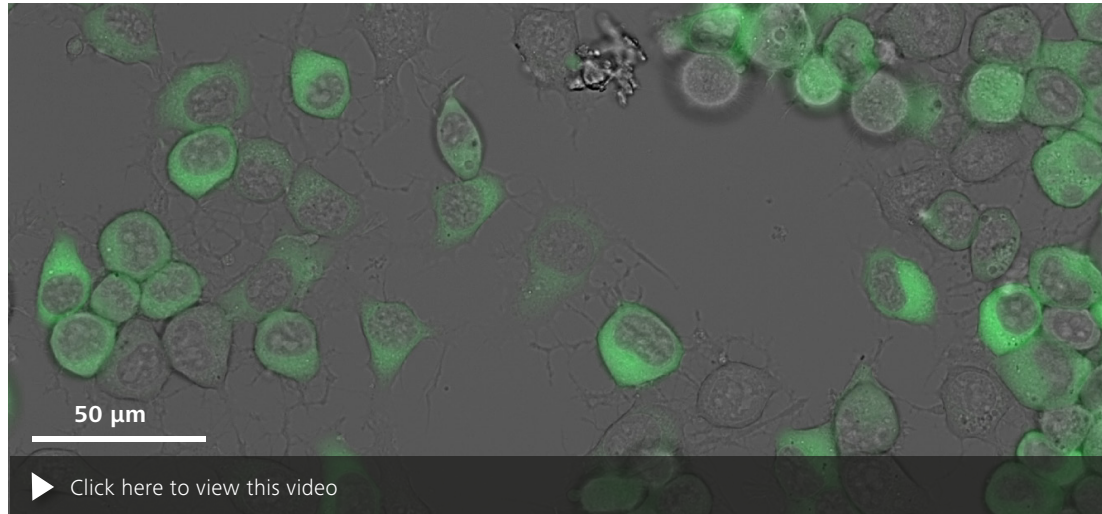
# Tailored Precisely to Your Applications

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service

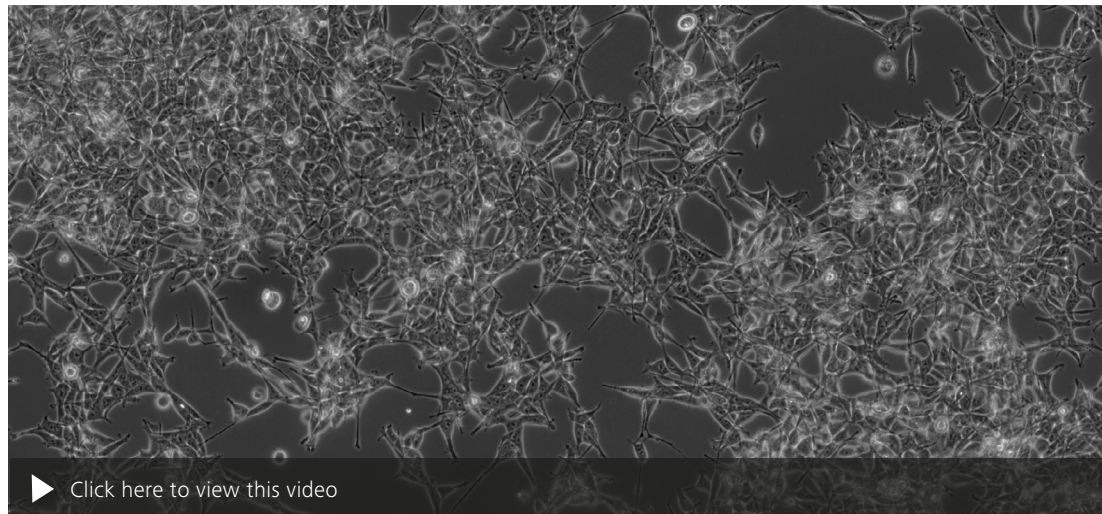
Typical Applications	Task	ZEISS Axio Observer offers
Label-free live cell cultures	Evaluate and document cell culture status	<ul style="list-style-type: none"> <li>■ PlasDIC contrast for high-resolution images through plastic vessels</li> <li>■ Objective lenses with long working distance and correction rings to enhance contrast and resolution</li> <li>■ Sample carriers and stages for large cell culture flasks</li> <li>■ Largest-in-class field of view (field number: 23 mm)</li> </ul>
Transfected live cell cultures	Evaluate and document transfection rate and transfection stability	<ul style="list-style-type: none"> <li>■ Gentle fluorescence excitation by Colibri 7</li> </ul>
Label-free fixed and thin tissue slices or small organism	Document and evaluate cell and tissue morphology and growth state	<ul style="list-style-type: none"> <li>■ Optimized DIC for low magnification, high numerical aperture multi-immersion lenses</li> </ul>
Reproductive or adherent cells and cell cultures	Mechanical manipulation of cells (e.g. injection of germ cells), injection of dyes and other biologically active substances	<ul style="list-style-type: none"> <li>■ Phase contrast, improved Hoffmann Modulation contrast (iHMC), DIC contrast</li> <li>■ Support for micromanipulators from Narishige, Eppendorf and Luigs &amp; Neumann</li> <li>■ Heated microscope stages and mounting frames, heating inserts</li> </ul>
Living Neuronal or muscular cell culture or tissue slices	Observation of fast densitometric, ratiometric and electrical signals	<ul style="list-style-type: none"> <li>■ Water- and silicon oil immersion lenses</li> <li>■ Apochromatic and UV-enhanced reflected-light illuminator</li> <li>■ Dual camera adapter Duolink</li> <li>■ Highspeed filter wheels and shutters</li> <li>■ Fast multicolor LED illumination with Colibri 7</li> <li>■ High efficiency filter sets</li> <li>■ Z-Piezo (500 µm) with large travel range</li> </ul>
Fixed immunofluorescence labelled tissue or cell culture samples	Identification, quantification and qualification of cell types, cell-, tissue and protein markers in 2D and 3D samples	<ul style="list-style-type: none"> <li>■ Definite Focus.2</li> <li>■ Dual filter wheel</li> <li>■ Apotome.2</li> <li>■ Piezo stage for high speed, high precision XY positioning</li> <li>■ Various mounting frames for different sample carriers</li> </ul>
Multi-labelled living tissue section, organs, organotypic-, spheroid or cell culture preparations	Long-term observation of physiological and morphological parameters in 2D/3D	<ul style="list-style-type: none"> <li>■ Autocorr objective lenses</li> <li>■ Definite Focus.2</li> <li>■ Special objectives for incubation</li> <li>■ LCI objectives</li> <li>■ LD objectives</li> <li>■ Water and silicone oil immersion objectives</li> <li>■ Aqua Stop II</li> <li>■ Incubation (heating/cooling), CO<sub>2</sub> and O<sub>2</sub> control</li> <li>■ Camera adapter for large field of view imaging (field number: 23 mm)</li> <li>■ Colibri 7</li> <li>■ Laser Manipulation (DirectFRAP)</li> </ul>
Microbiomes, Bacteria and Yeast cultures	Identification and characterisation of cell wall, cell cycle and host-parasite interaction.	<ul style="list-style-type: none"> <li>■ C-Apochromat 100x/1.25 W Corr</li> <li>■ Plan-APOCHROMAT 150x/1.35 Glyc Corr DIC</li> </ul>

# ZEISS Axio Observer at Work

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service



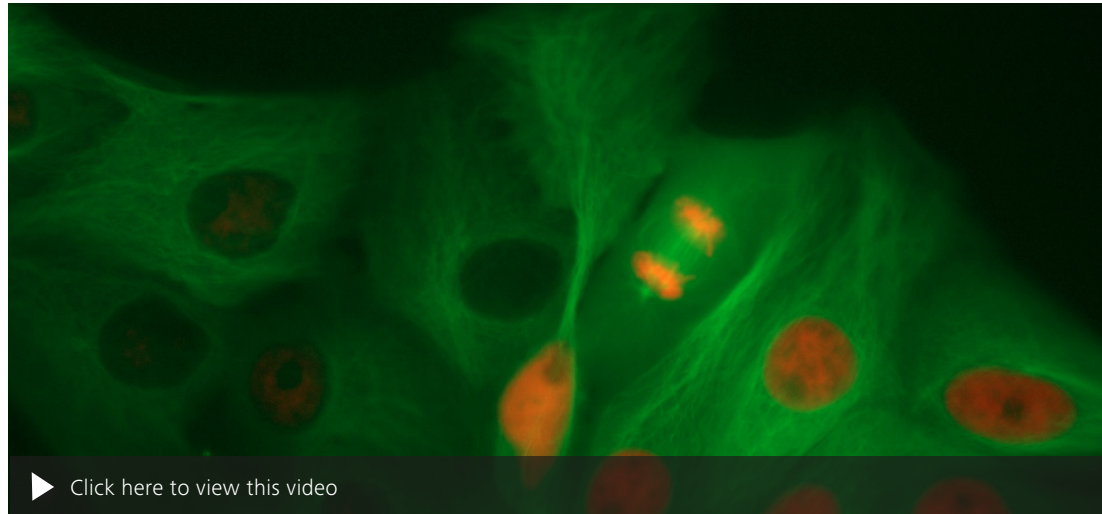
*HeLa cell culture with cytosolic eGFP. Proliferation imaged over 16 hours.*



*HEK 293 cells. Long-term time lapse recording of 3x3 tiles with 240s interval. Acquired with Axiocam 506 mono, stabilized by Definite Focus.2 at 10s interval.*

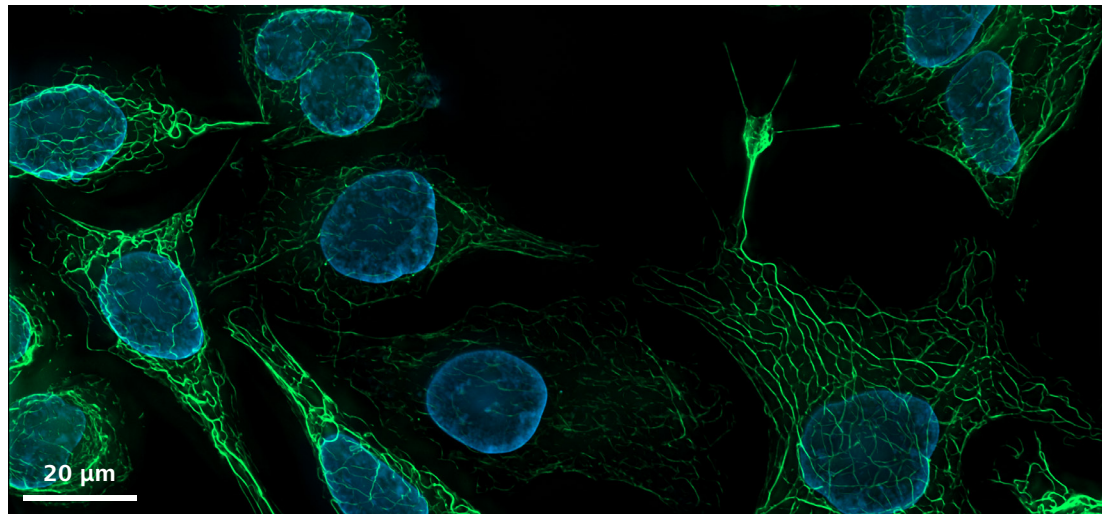
# ZEISS Axio Observer at Work

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service



▶ [Click here to view this video](#)

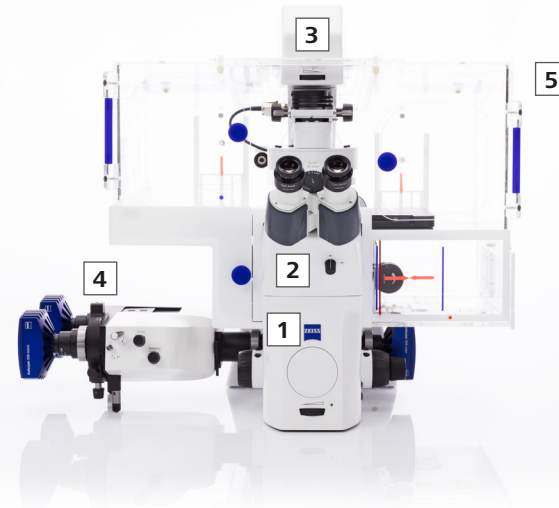
*LLC PK1 cells. Time lapse recording of undisturbed cell division.*



*SK8 K18 mouse cells. Vimentin stained with Alexa 488 (green), nuclei stained with DAPI (blue).*

# Your Flexible Choice of Components

- › In Brief
- › The Advantages
- › The Applications
- › **The System**
- › Technology and Details
- › Service



## 1 Microscope

- Axio Observer 3: fully manual stand
- Axio Observer 5: manual stand with encoded nosepiece and encoded or motorized reflector turret
- Axio Observer 7: motorized stand with motorized Z-drive
- Light Manager and Contrast Manager
- Depending on stand version:  
Manual, coded or motorized Optovar turret, available magnifications: 1x, 1.6x, 2.5x
- Manual, coded or motorized 6x reflector turret

## 2 Objectives

- C-APOCHROMAT Autocorr
- C-APOCHROMAT
- LD LCI Plan-APOCHROMAT Autocorr
- Plan-APOCHROMAT
- EC Plan-NEOFLUAR
- LD A-Plan
- Temperature isolated i LCI Plan-NEOFLUAR

## 3 Illumination

- UV/VIS Reflected Light Beampath for fluorescence with high speed shutter, Dual Filter Wheel, Fast Excitation Filter Wheel, high efficiency filter sets
- Software controlled metal-halid light source HXP 120 V
- Fast multicolor LED illumination system Colibri 7
- Transmitted light beam path with manual or motorized condensor with long-working distance
- VisLED for fast Acquisition
- Differential Interference Contrast (DIC), Plas-DIC, Phase Contrast, improved Hoffman-Modulation Contrast (iHMC)

## 4 Imaging Systems

- Cell Observer SD
- Cell Observer HS
- Apotome.2
- LSM 800 with Airyscan
- LSM 880 with Airyscan
- Elyra superresolution systems

## 5 Accessories

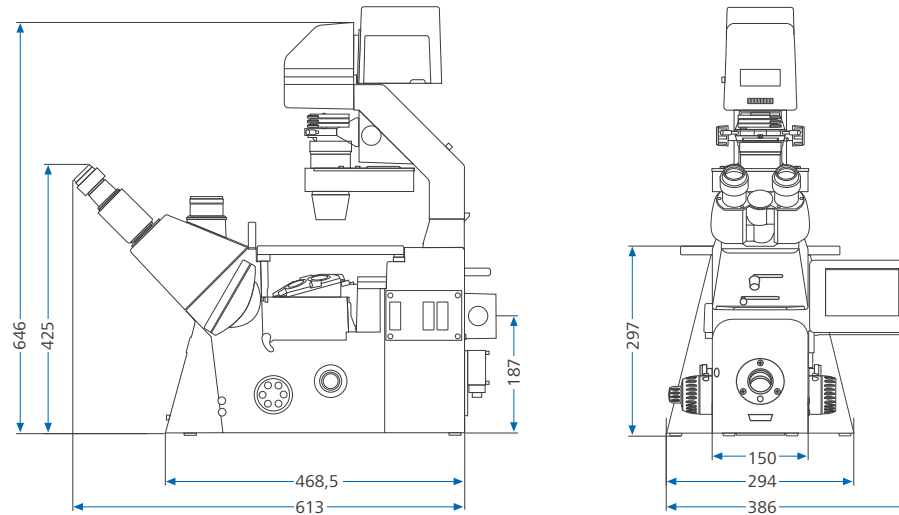
- Broad incubation portfolio (heatable mounting frames, heating inserts, CO<sub>2</sub> and O<sub>2</sub> controller)
- High precision / high speed motorized scanning stages and a range of manual stages
- Z-piezo stage insert with 500 µm travel range
- Adjustable dual camera adapter Duolink
- All Axiocam microscope cameras

## 6 Software

- ZEN (blue edition), recommended modules: Tiles & Positions, Experiment Designer, Physiology, Deconvolution, 3DxI Viewer – powered by arivis®

# Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service



For more detailed information on dimensions please contact us at [microscopy@zeiss.com](mailto:microscopy@zeiss.com)

	Option	3	5	7
Stand	manual	+	+	-
	motorized	-	o*	+
Encoding	readable by PC	+	+	+
Display	LCD display	-	o**	-
	TFT display	-	-	+
	Docking station	-	-	o
Interfaces	CAN	+	+	+
	RS 232	-	+	+
	USB	+	+	+
	TCP/IP	-	+	+
	Socket for external UNIBLITZ shutter	-	+	+
	Trigger socket (In/Out) for shutter	-	+	+

+ = included in stand    o = optionally available    o\* = optional: reflector turret mot., reflected-light illumination mot., LD condenser 0.55 mot.  
o\*\* = requirement (either Carrier for transmitted-light illumination with LCD display (423922-0000-000) or Holder with LCD display and Light Manager (432923-0000-000)    +\*\*\* = "simple" Light manager    - = not available

# Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

Option		3	5	7
4-position CAN hub		–	o	o
Light manager		+***	+	+
Contrast manager		–	–	+
Circular operation key unit	right	–	+	+
	left	–	–	+
Z-focus drive	manual	+	+	–
	motorized, stepper motor drive (z-step size 10 nm)	–	–	+
Adjustable limit stop for z focus	manual	–	+	–
Automatic Component Recognition (ACR)	Nosepiece ACR	–	–	o
	Reflector turret ACR	–	o	o
Power supply	internal	+	+	–
	external	–	–	+
Z-drive operation (flat control knob)	right	o	–	o
	left	o	+	o
Z-drive, 13 mm extended travel range	manual	o	o	–
	motorized	–	–	o
Nosepiece	6-pos. H DIC cod.	+	+	–
	6-pos. H DIC mot.	–	–	o
	6-pos. H DIC mot. ACR	–	–	o
Definite Focus.2	incl. nosepiece 6-pos. H DIC mot. ACR	–	–	o
Autocorr Objectives		–	–	o
Contrast methods transmitted light	PlasDIC	o	o	o
	PlasDIC with contrast slider	o	o	–
Tube lens mount, fixed/Optovar turret	1-pos. tube lens mount, fixed	+	o	o
	3-pos. optovar turret, encoded	–	o	–
	3-pos. optovar turret, motorized	–	–	o

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- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

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Sideport (type)	2 or 3-pos. man. (exit to the left only)	+	–	–
	2 or 3-pos. man. L/R	–	+	–
	3-pos. mot. L/R	–	–	+
Sideport (accessory)	60N L, 2 switching positions (100% vis : 0% L / 20% vis : 80% L)	o	o	–
	60N L 100, 2 switching positions (100% vis : 0% L / 0% vis : 100% L)	o	o	–
	60N L, 3 switching positions (100% vis : 0% L / 0% vis : 100% L / 50% vis : 50% L)	o	o	o
	60N R, 3 switching positions (100% vis : 0% R / 0% vis : 100% R / 50% vis : 50% R)	–	o	o
	60N L/R 3 switching positions (100% vis : 0% LR / 0% vis : 100% L / 20% vis : 80% R)	–	o	o
	60N R/L 100, 3 switching positions (100% vis : 0% LR / 0% vis : 100% L / 0% vis : 100% R)	–	o	o
	60N L 80/R 100, 3 switching positions (100% vis : 0% LR / 20% vis : 80% L / 0% vis : 100% R)	–	o	o
Path deflection to the tube (VIS only)		+	o	o
Beam path switching (for VIS / frontport / baseport)	manual	–	o	–
	motorized	–	–	o
Baseport / Frontport		–	o	o
Scanning stages	Scanning Stage 130x85 mot; CAN	o	o	o
	Scanning Stage 130x100 STEP	o	o	o
	Scanning Stage 130x100 PIEZO	o	o	o
	Scanning Stage XY DC 110x90 with attachment Z Piezo/Rot.En.	o	o	o
Stage attachment Z PIEZO		o	o	o
Carrier transmitted-light illumination	without LCD display	o	–	o
	with LCD display	–	o**	–
Illuminator transmitted-light		o	o	o
Condensers	LD 0.35 / LD 0.55, manual	o	o	o
	LD 0.55, motorized	–	o	o
	Axio Imager 0.8/ 1.4	o	o	o
Shutter for transmitted-light	internal	–	o	o
	external, High Speed (with int. controller)	–	o	o

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- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

	Option	3	5	7
Reflected light illumination	manual	o	o	o
	motorized	–	o	o
Slider for reflected light illumination	manual	o	o	o
	motorized	–	o	o
Shutter for reflected light	Shutter FL, internal	o	o	o
	High Speed, external (with int. controller)	–	o	o
Illumination system	Colibri 7	o	o	o
Reflector turret	6-pos. manual	o	o	–
	6-pos. encoded	–	o	o
	6-pos. motorized	–	o	o
	6-pos. motorized ACR	–	o	o
Switching mirror mot.; CAN	motorized	–	o	o
	Dual filter wheel mot. for beam splitting and emission; CAN	–	–	o
	Filter wheel excitation 8-pos. mot. for filters d=25 mm; CAN	–	–	o
Laser safety upgradeable	Cell Observer SD/DirectFRAP	–	–	o
	LSM	–	–	o
Apotome / Apotome.2		–	o	o

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## Count on Service in the True Sense of the Word

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › Technology and Details
- › **Service**

Because the ZEISS microscope system is one of your most important tools, we make sure it is always ready to perform. What's more, we'll see to it that you are employing all the options that get the best from your microscope. You can choose from a range of service products, each delivered by highly qualified ZEISS specialists who will support you long beyond the purchase of your system. Our aim is to enable you to experience those special moments that inspire your work.

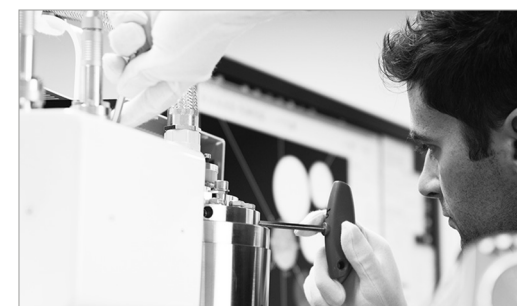
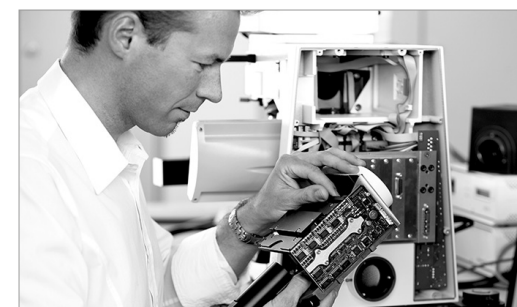
### **Repair. Maintain. Optimize.**

Attain maximum uptime with your microscope. A ZEISS Protect Service Agreement lets you budget for operating costs, all the while reducing costly downtime and achieving the best results through the improved performance of your system. Choose from service agreements designed to give you a range of options and control levels. We'll work with you to select the service program that addresses your system needs and usage requirements, in line with your organization's standard practices.

Our service on-demand also brings you distinct advantages. ZEISS service staff will analyze issues at hand and resolve them – whether using remote maintenance software or working on site.

### **Enhance Your Microscope System.**

Your ZEISS microscope system is designed for a variety of updates: open interfaces allow you to maintain a high technological level at all times. As a result you'll work more efficiently now, while extending the productive lifetime of your microscope as new update possibilities come on stream.



*Profit from the optimized performance of your microscope system with services from ZEISS – now and for years to come.*

>> [www.zeiss.com/microservice](http://www.zeiss.com/microservice)



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