

Axio Imager Vario
Dedicated to Large Sample Analysis



Maximum stability and precision for large samples
in materials analysis and quality control.



We make it visible.

Exceeds all Expectations

In materials microscopy the size of the sample space is one of the determining criteria when it comes to quality testing, quality assurance and materials analysis as well as to the development of future materials.

Axio Imager Vario, the new addition to the tried-and-tested Axio Imager system series does justice to these demands – with consistently high optical performance, functionality and stability.

Axio Imager Vario stands for maximum precision combined with the largest possible sample space – in research, development and quality assurance – involving solar cells, wafers or flat panel displays, for example.

At a glance –

The outstanding features of Axio Imager Vario:

- Stable column design
- Impressive sample space with vertical extension up to 254 mm and sample travel range up to 300 mm
- Nosepiece focus with step-size resolution up to 10 nm
- Excellent optics with outstanding contrast for the best resolution
- Reflected-light illuminator with apochromatically corrected field lens
- Maximum precision and reproducibility through motorized components

Title:

*Mono-crystalline silicon solar cell
Circular Differential Interference Contrast
EC Epiplan-APOCHROMAT 50x / 0.95*

Right:

*Axio Imager.A2 Vario with MARC control unit and
Axio Imager.Z2 Vario with docking station and
transmitted-light module.*





Well-thought-out Components – Perfectly Adapted to your Requirements

Axio Imager Vario offers a flexible system platform for research, testing and development involving large material samples in areas such as the solar, flat panel and wafer industries.

The column – High level stability

A column with aluminum base plate forms a stable basis for the Axio Imager Vario microscope, while the precise guides that have been integrated into the column allow exact adjustment of the sample space in the z-direction – from a height of 0 to a maximum of 254 mm – according to the objects being examined. Thanks to the lockable height stop, the sample is reliably protected against damage.

The nosepiece focus – Reliable focus and repeat accuracy

As the sample is brought into focus by moving the nosepiece up and down, it is not necessary to move the sample itself. This means, particularly in the case of heavy samples, that it is possible to guarantee consistent focus and repeat accuracy. Both stand variants – Axio Imager.A2 Vario and Axio Imager.Z2 Vario – are equipped with a motorized nosepiece focus, which has a 5 mm stroke and a step-size resolution of 25 or 10 nm.



The sample is brought into focus simply by moving the nosepiece up and down.

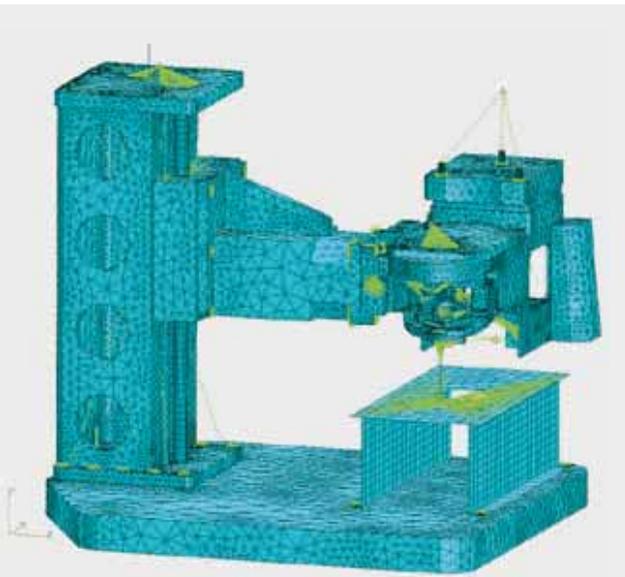


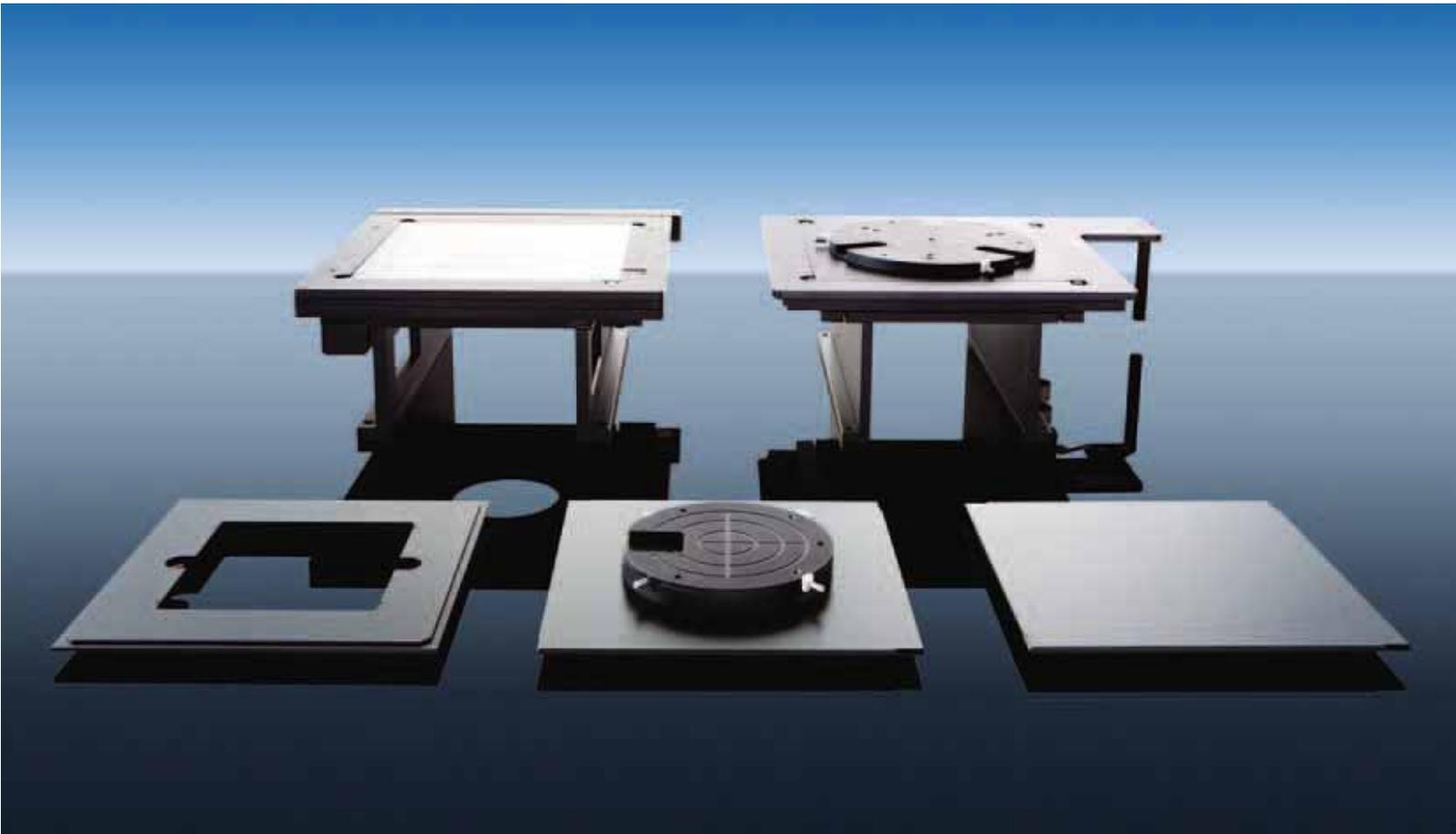
Operating elements for precise adjustment of the microscope module in the z-direction and lockable height stop.



Available as an option: manual transmitted-light module, suitable for Köhler illumination, for all common contrasting techniques.

Stable column design:
vibration-free working





The stages and sample holders – The perfect basis

Depending on the application, four different sample stages for reflected-light and transmitted-light can be selected:

- manual stage with 200 mm travel range for reflected-light and transmitted-light
- manual stage with 300 mm travel range for reflected-light
- scanning stage with 200 mm travel range for reflected-light and transmitted-light
- scanning stage with 300 mm travel range for reflected-light and 200 mm travel range for transmitted-light

The manual stages are equipped with a coupler which can be used to switch between the regular x-y drive and a handle for rapid movement. It is possible to control the

scanning stages with a repeat accuracy of 1 μm either via the optional x/y drive on the Docking Station, via a separate joystick or using the PC. Numerous different insert plates and sample holders such as chucks for different wafer sizes, ensure the flexibility needed to be able to analyze the widest possible range of materials reliably. In the case of particularly tall samples, the sample stage can be dispensed with entirely.

The transmitted-light module – Light from below

A manual transmitted-light module suitable for Köhler illumination is available as an option for all common contrasting techniques. This module can be equipped with halogen or LED illumination. In addition to a luminous field diaphragm, it also has a switchable diffusion screen, as well as an insert for a double filter wheel to hold neutral-density filter sets. Four different condensers are available.

The Microscope Modules Perfectly Equipped - Manual or Motorized

Whether for manual or motorized microscopy – with its three available modules, Axio Imager Vario offers the right solution for every analysis need.



Axio Imager.A2 Vario

The partially motorized microscope module Axio Imager.A2 Vario offers a solid base for measurement, analysis and documentation in the area of materials microscopy. It is the right choice for applications where, although a large sample space is required, no motorization is necessary – for changing the contrasting technique or magnification, for example. Light intensity and the motorized nosepiece focus (with 25 nm step-size resolution) can be adjusted conveniently using the freely positionable MARC (Manual Rotary Control) control unit or PC, while coding of the key components allows essential microscope parameters to be adopted by the AxioVision software. The objective and total magnification, contrasting techniques and brightness settings are stored and can be retrieved at any time.



Axio Imager.Z2 Vario

The powerful Axio Imager.Z2 Vario microscope module is fully motorizable and therefore the perfect system for complex applications and challenging tasks that demand a high degree of automation. Your work is made considerably easier thanks to the motorized reflected-light beam path, which allows all light and contrast settings to be precisely reproduced. All the motorized components of the microscope module can be controlled via the docking station (which is also freely positionable) or PC – ensuring a high degree of operating comfort and reproducibility. The integrated user administration also means that work can be managed simply and clearly in a multi-user environment. Use of the MARC control unit is also an option.

In addition to reflected light, both Axio Imager.A2 Vario and Axio Imager.Z2 Vario microscope modules can be equipped with the manual transmitted-light unit and can be freely combined with the sample stages available.

Axio Imager.Z2 Vario without focus

Axio Imager.Z2 Vario without focus is the third microscope module available. Apart from the nosepiece focus, it offers the same functionality as Axio Imager.Z2 Vario. This model is recommended for situations in which the microscope module is integrated into custom solutions that make use of the external focus drive of the customer's own system. Once again, this microscope module, together with the optional Control Box, can also be controlled via the Docking Station or a PC.

The Optics - Brilliant Vision

Axio Imager Vario is the logical continuation of the Axio Imager family, with its tried-and-tested, renowned optical performance.

The illumination concept – Information in brilliant quality

You will see your objects in brightfield and darkfield in proven outstanding quality. Stray light has been minimized and imaging is virtually aberration free. Excellent image contrasts is achieved, especially in interference contrast and even at high magnifications.

The objective series – Experience Enhanced Contrast (EC)

To obtain comprehensive image information, you need to use a wide range of objectives. With the Axio Imager Vario objective series, Carl Zeiss has provided solutions for all kinds of requirements, in various price and performance categories.

Further information
can be found at
www.zeiss.de/objectives



EC EPIPLAN Objectives

The economical, all-around series of objectives, which have been achromatically corrected and strain-minimized for impressive-quality DIC create a flat field image for an intermediate image size of 23 mm and are available in brightfield or brightfield/darkfield variants. The exit pupils are always identically positioned, and Differential Interference Contrast in circularly polarized light is possible with all EC EPIPLAN objectives using a single C-DIC prism.



EC Epiplan-NEOFLUAR Objectives

The particularly high-contrast EC Epiplan-NEOFLUAR objectives, which have been corrected to a high degree and strain minimized, enable you to achieve sharp C-DIC and create a flat, 25 mm field of view – ideal for displaying fine color and structural details, e.g. lamellae in spherulitic graphite. Available as DIC/C-DIC, Brightfield/ Darkfield, Pol and LD (long working distance) variants, they also offer the additional benefits of long working distances and high numerical apertures.



EC Epiplan-APOCHROMAT Objectives

The EC Epiplan-APOCHROMAT objectives satisfy the very highest demands. They are ideal for imaging color and structural details in the sub-micrometer range and are renowned for offering the best correction and highest numerical apertures. Based on ICS optics from Carl Zeiss, these innovative Enhanced Contrast objectives perform at the limits of what optics can achieve with regard to contrast and reproduction accuracy.



Axio Imager Vario also offers you the convenience of being able to control all functions remotely.

The tube lens turret – Increase your flexibility

With its flexible magnification range, the Axio Imager Vario tube lens turret offers greater variability when it comes to adapting the desired frame. The tube lens turret is available in two variants: 1) Encoded: this variant allows you to achieve an exact magnification and automatically save the scaling factors that can be derived from this in the image for the analysis. Measurement results are reliable, documentable and reproducible. 2) Motorized: this variant offers you additional operating comfort for your system solutions. And Axio Imager Vario tube lens turret offers yet another advantage: the use of a focusable Bertrand lens, an important component for the easy observation of the objective exit pupil.

The modulator turret – Easy to operate

Switching quickly and easily from one contrasting technique to another – the C-DIC modulator turret has been developed precisely with this goal in mind. Each of the four positions can be conveniently selected with a simple turn. The motorized variant is particularly easy to operate. When switching to interference contrast, the correct module with the setting you have previously defined is automatically activated. If you switch to brightfield or darkfield, the blank position will also be automatically selected for fast and, above all, reproducible results.

The nosepiece – Flexibility in detail

The nosepiece provides room for up to seven objectives. You now have a sufficient number of objectives to use the entire standard magnification series. This increases reliability and the sample throughput rate. Naturally, it is also possible to combine objectives.

The reflector turret – Switching made easy

All Push&Click contrast modules can be stored securely in six or ten positions and activated as needed using manual or motorized method.

The motorized diaphragms – Constant image quality

Using the motorized aperture and luminous field diaphragms you can achieve error-free, reproducible settings and, consequently, constant image conditions. Motorization guarantees you comparable results and higher productivity by automating the workflow.

The aperture diaphragm – Simple, but clever

It is often simple optimized detail that can improve your day-to-day work. A perfect example of this is the newly developed aperture diaphragm from Carl Zeiss. This is a slider with a motorized aperture-diaphragm revolver. The special feature is a disk with fixed diaphragms that rotates rather than the usual aperture iris that is opened and closed. Thanks to this improved component, we are able to guarantee you a twofold advantage: greater repeat accuracy and a longer life for the component.



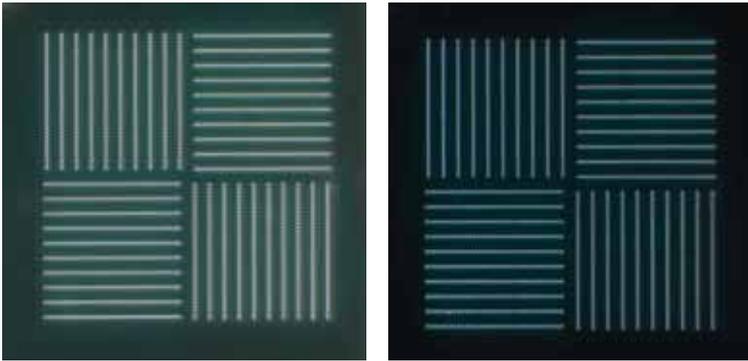
More options, faster handling: The reflector turrets with Push & Click Modules.



Greater comfort, simpler changing of contrasting techniques: The modulator turret for interference contrast.

The Contrasting Techniques - Observing in New Dimensions

Numerous imaging options improve the visualization of your samples. For demanding tasks, Carl Zeiss' innovative C-DIC technique makes it possible to achieve a clearly visible improvement in your results.



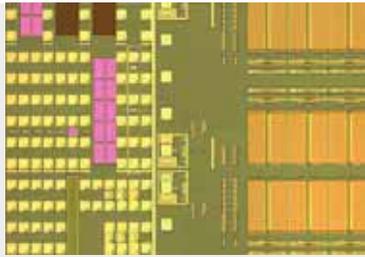
Test structures, period 1.6 μm EC Epiplan-APOCHROMAT 50x / 0.95, 8 / 0, camera-adapter 0.63x

Brightfield and darkfield – Maximum homogeneity and a stray light free image background

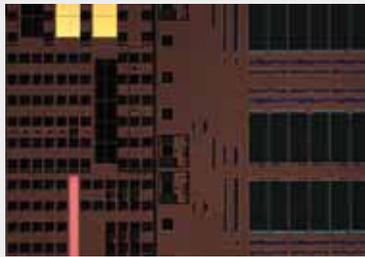
In brightfield the Axio Imager Vario provides homogeneous illumination and exceptional contrast while, in darkfield, the background is so dark that the technique has earned a special name: ADF – Advanced Darkfield. By minimizing disturbing stray light and reducing the longitudinal color aberration of the illumination optics, this darkfield is suitable for the most challenging of samples and impresses even when faced with the finest of structures. Switching between techniques only requires a simple turn. The motorized stand models allow you to work particularly quickly and conveniently.

Surface of a silicon wafer recorded with a 5x EC Epiplan-APOCHROMAT objective. The same point is shown in three different contrasting techniques: Brightfield, darkfield and C-DIC. Thanks to the different contrasting, different details become visible on the surface of the wafer in each case.

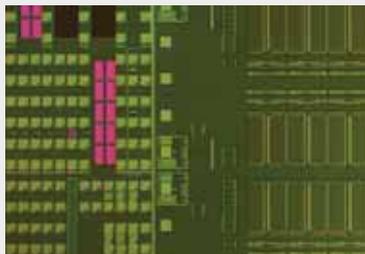
Brightfield



Darkfield



C-DIC



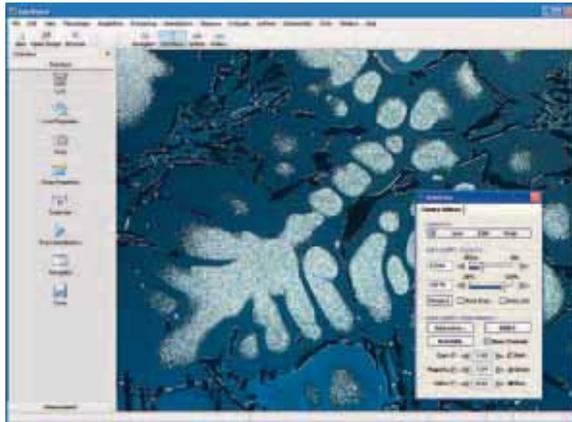
C-DIC – Perfect for all structures

Circular Differential Interference Contrast (C-DIC) is an optical polarization procedure that, in contrast to the common differential interference contrast (DIC), works with circular, polarized light. The advantages of this procedure are crucial for the contrasting of diverse directed object structures. There is no longer the need for the preparation be turned in the azimuth – with the C-DIC, a simple turn in the operating element of the C-DIC slider or modulator turret is sufficient and all successive object information can be captured. Additionally, it also allows for every chosen fragmentation of every directed structure to be adjusted. This means that with one DIC prism, a high contrast as well as a high resolution can be achieved.

The Software - Utilizing Modularity

In the fields of material research and design, requirements and areas of application are changing. Modular and customizable, the AxioVision image analysis software, combines with Axio Imager Vario in order to offer you maximum flexibility and capability when analyzing your images.

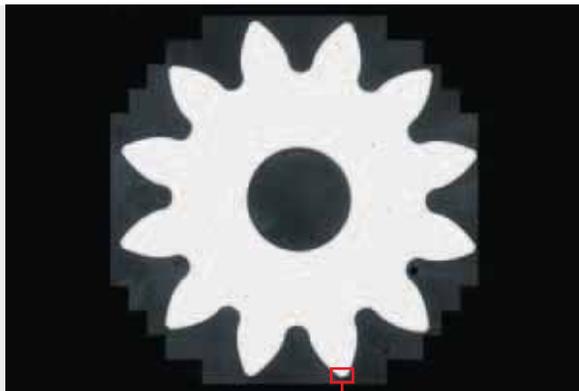
Simple, clearly presented user interface for camera control and image acquisition.



AxioVision Basic

AxioVision offers you automated control of your ZEISS microscope, allowing you to acquire, analyze and document features such as crystalline microstructures in your samples in a single operation. Only AxioVision enables you to benefit from the ZVI image format, developed by Carl Zeiss specifically for microscopy. The quality, content and meaningfulness of your valuable images are retained with no loss of information and with the added benefit of integrated documentation of the imaging conditions – essential for repeatability and the validation of your data. Depending on your requirements, the functionality of your selected system can be expanded to include various modules or adapted to individual applications, meaning that you have an expandable solution for your microscopy applications.

MosaiX image of a gearwheel, 15x20 tiles.



Detailed view: individual tile of the MosaiX image.



MosaiX

Developed to enable you to acquire images of large objects, MosaiX scans your samples in their entirety in just one process. An overall image is then created from the individual image tiles. This serves as an ideal overview image for navigating around the sample or as the basis for further analyses. From the MosaiX image you can perform measurements that cross image fields – the tiles present no restriction – allowing you to gain valuable insights into the context and relationships of features of interest.

The Cameras - Preserving What You See

Axio Imager Vario provides an outstanding platform for using a wide range of cameras, with the AxioCam family of Carl Zeiss forming the ideal combination.

The AxioCam family – Flexibility and performance

As customized components in the Carl Zeiss Systems environment, camera, microscope and software are perfectly matched to form a system solution in digital imaging that opens up new perspectives – in the areas of performance, flexibility and operating comfort and for both research and routine applications. Axio Imager Vario microscope platform offers great flexibility in camera use thanks to its standardized camera ports (C Mount) in the stand and a complete assortment of camera adaptors. From digital compact cameras (e.g., from Canon) up to professional, research-grade cameras of the Carl Zeiss AxioCam family, a wide variety of cameras are supported by the AxioVision image capture

and analysis software. All digital cameras from Carl Zeiss are offered complete with a free entree-level version of AxioVision and guarantee optimal image quality.

Some models are also available in a black and white version with an extended sensitivity range. The sophisticated integration of Carl Zeiss cameras delivers important advantages: high speed, correct resolution, optimized live images or automatic exposure adjustment. All cameras in the AxioCam family are controlled via a uniform user interface in AxioVision. Naturally, you can also adapt the camera operation individually to the wide range of applications you work on.

<p>Entry Level</p>	<p>AxioCam ERc 5s <i>Economical and extremely flexible 5 megapixel CMOS camera</i></p> 	<p>AxioCam ICc <i>Economical CCD cameras with 1.4 or 3.3 megapixel</i></p> 
<p>Mid-Range</p>	<p>AxioCam MRc <i>High-quality 1.4 megapixel camera with good signal quality and a large dynamic range</i></p> 	<p>AxioCam MRc5 <i>High-quality 5 megapixel camera with good signal quality</i></p> 
<p>High-End</p>	<p>AxioCam HRc <i>13 megapixel camera with maximum resolution, extremely flexible settings and the maximum possible signal quality</i></p> 	



The Ergonomics - Relax While You Work

The Ergophototube – Relaxed work

For applications where great importance is attached to ergonomics, two different Ergophototubes are available: the Ergophototube with an upright, unreversed image, 44 mm continuous height adjustment and 20° viewing angle and the Comfort-Ergophototube with an upright, unreversed image, 50 mm continuous height adjustment and continuous horizontal extension of 50 mm and 15° viewing angle.

The docking station – Remote Microscopy

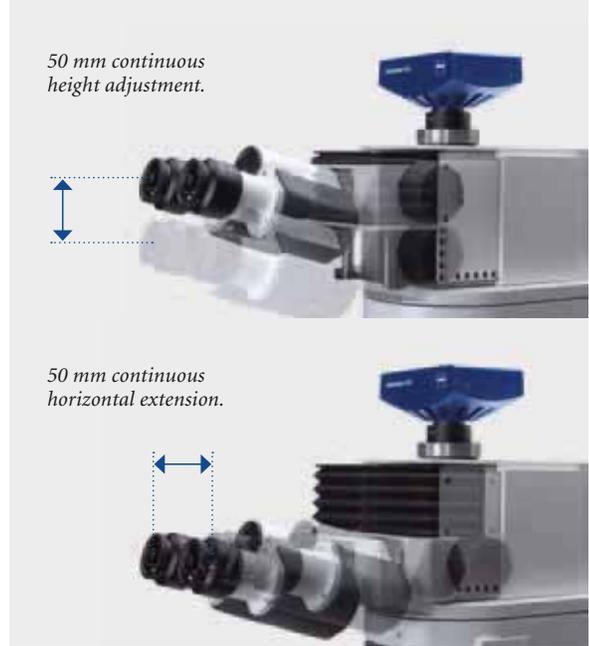
The freely positionable docking station operating module makes it possible to control the light intensity and all motorized components of the Axio Imager.Z2 Vario. It has a coarse and fine focus drive, a freely programmable ring of buttons and a touch screen (TFT). In order to simplify complex steps, all the main functions have been grouped together on the touch-screen. This allows you to control all motorized components easily at the touch of a button and to display and control the microscope status. If required, the integrated light and contrast managers ensure the best possible light and contrast setting. In addition to fixed presettings, it is also possible to store complex procedures as individual settings and retrieve them at any time on a user-specific basis with just the touch of a button. Axio Imager.Z2 Vario is therefore ideal for use even in a multi-user environment.

MARC (Manual Rotary Control) – Numerous functions all in one place

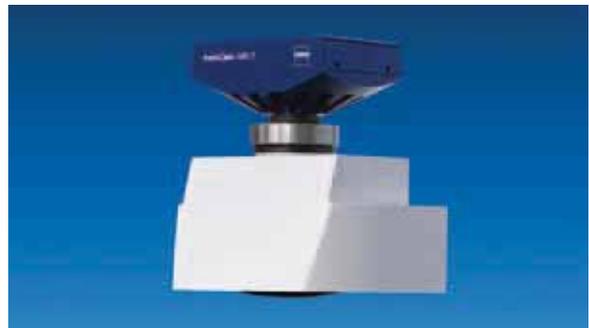
The control unit MARC enables you to control key microscope functions, which can all be operated intuitively and extremely conveniently using just one hand via the coarse and fine drive knob and a ring of buttons.

Depending on the microscope module connected, MARC can be used in different ways: with Axio Imager.A2 Vario the unit is also used – in addition to focusing and the brightness control – to open and close the shutter to the light intensity values of the nosepiece position and to switch between reflected-light and transmitted-light.

In the case of Axio Imager.Z2 Vario, on the other hand, MARC can be used as an optional control unit alongside the docking station. In this case the configuration of the buttons reflects the ring of buttons on the docking station. Users who prefer working with two focus drive knobs can therefore use MARC and the docking station at the same time in parallel. MARC can either be positioned freely using the tabletop base or attached to manual stages close to the x-y drive. The advantage of this is that the user can focus, control brightness and move the sample with just one hand.



The Comfort-Ergotube allows the user to adopt a relaxed position even when working with large sample stages.



For users who want or need to sacrifice direct viewing into the microscope, a tube module is available without an eyepiece for viewing.



The docking station offers the possibility of controlling the motorized stage via an optional coaxial drive.



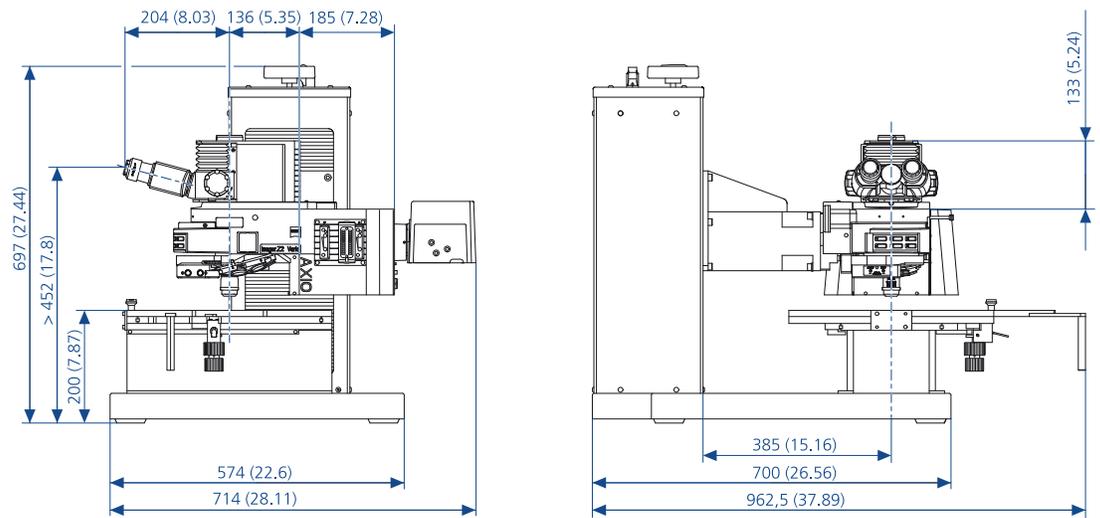
The MARC control unit allows the key functions to be controlled intuitively and extremely conveniently with just one hand.

Axio Imager Vario

Technical Data



Component	Option	Axio Imager.A2 Vario	Axio Imager.Z2 Vario	Axio Imager.Z2 Vario without focus
Stand	manual	+	-	-
	motorized	-	+	+
Control box	-	+	+	0
Coding (can be read out from PC)	-	+	+	+
Remote control	MARC	+	0	0
	Docking Station with TFT	-	0	0
Contrast manager	-	-	+	+
Light manager	-	+	+ ^{**}	+ ^{**}
Tube lens turret	coded	0	-	-
	motorized	-	0	0
Reflector turret	6-pos. coded	+	-	-
	6-pos. motorized	-	0	0
	6-pos. motorized ACR	-	0	0
Nosepiece	6-pos. coded POL Vario	0	-	-
	6-pos. coded BD DIC Vario	0	-	-
	6-pos. motorized POL Vario	-	0	0
	6-pos. motorized BD DIC	-	0	0
	7-pos. motorized BD	-	-	0
Modulator turret for C-DIC/TIC	manual	0	0	0
	motorized	-	0	0
Transmitted-light illumination	manual	0	0	0
Double filter wheel (transmitted light)	manual	0	0	0
	motorized	-	-	-
Reflected-light illumination	manual	+	-	-
	motorized	-	+	+
Luminous field diaphragm (reflected light)	manual	+	0	0
	motorized	-	0	0
Aperture diaphragm (reflected light)	manual	0	0	0
	motorized	-	0	0
Aperture diaphragm (reflected light) with aperture-diaphragm revolver	motorized	-	0	0
Double filter wheel (reflected light)	manual	0	0	0
	motorized	-	0	0
FL attenuator	manual	0	0	0
	motorized	-	0	0
Light switching reflected light/transmitted light	manual	0 ^{***}	+	+
	via Docking Station / MARC	0 ^{***}	0 ^{***}	0 ^{***}
Mixed light	manual	0 ^{****}	0 ^{****}	0 ^{****}
	via Docking Station	-	0 ^{***}	0 ^{***}
Nosepiece focus	motorized, 10 nm step size resolution	-	+	-
	motorized, 25 nm step size resolution	+	-	-
Apotome	-	0	0	0
Scanning stages	DC stepper motors	0	0	0



Microscope module	Axio Imager.A2 Vario	Axio Imager.Z2 Vario	Axio Imager.Z2 Vario without focus
Height of sample space	0 - 254 mm (reflected light, without stage) 0 - 112 mm (reflected light, with stage) 0 - 88 mm (transmitted light, with stage)	0 - 254 mm (reflected light, without stage) 0 - 112 mm (reflected light, with stage) 0 - 88 mm (transmitted light, with stage)	-
Stroke of nosepiece focus	5 mm	5 mm	-
Depth of sample space	385 mm (optical axis to column)	385 mm (optical axis to column)	-
Maximum travel range of stages	300 mm x 300 mm	300 mm x 300 mm	-
Maximum transmitted-light area	200 mm x 200 mm	200 mm x 200 mm	-
Dimensions of microscope module	180 x 260 x 420 mm (height x width x depth)		
Mass of microscope module	17.5 to 20 kg depending on equipment		
Mass of base plate and column	approx. 78 kg	approx. 78 kg	-
Dimensions of base plate	700 mm x 574 mm (width x depth)	700 mm x 574 mm (width x depth)	-
Eyepiece	Field of view number 23 or 25		
Objective magnification	1x - 150x		
Objectives	Reflected light: EC EPIPLAN, EC Epiplan-NEOFLUAR, EC Epiplan-APOCHROMAT Transmitted light: N-ACHROPLAN, EC Plan-NEOFLUAR, Plan-APOCHROMAT, C-APOCHROMAT, FLUAR Special: LD EPIPLAN, LD EC Epiplan-NEOFLUAR		
Tubes	Tube without binocular eyepiece, binocular tubes, phototubes, ergotubes and ergophototubes		
Stages	Manual mechanical stages and motorized scanning stages for reflected light and transmitted light with travel ranges of 200 mm x 200 mm or 300 mm x 300 mm		
Illumination	12V 100W HAL, 100W HBO, VIS LED		
Contrasting techniques	Reflected light: brightfield, darkfield, differential interference contrast, circular differential interference contrast, simple polarization, fluorescence Transmitted light: brightfield, darkfield, differential interference contrast, polarization, phase contrast		

- + Included with stand
- O Optional
- Not possible
- * Light manager manual Imager
- ** Light manager motorized Imager
- *** With additional CAN-power supply
- **** With additional power supply



At a glance – The outstanding features of Axio Imager Vario:

- Stable column design
- Impressive sample space with vertical extension up to 254 mm and sample travel range up to 300 mm
- Nosepiece focus with step-size resolution up to 10 nm
- Excellent optics with outstanding contrast for the best resolution
- Reflected-light illuminator with apochromatically corrected field lens
- Maximum precision and reproducibility thanks to motorized components

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