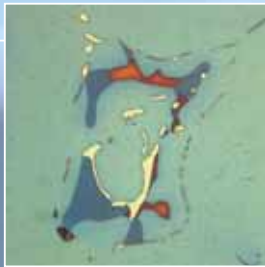
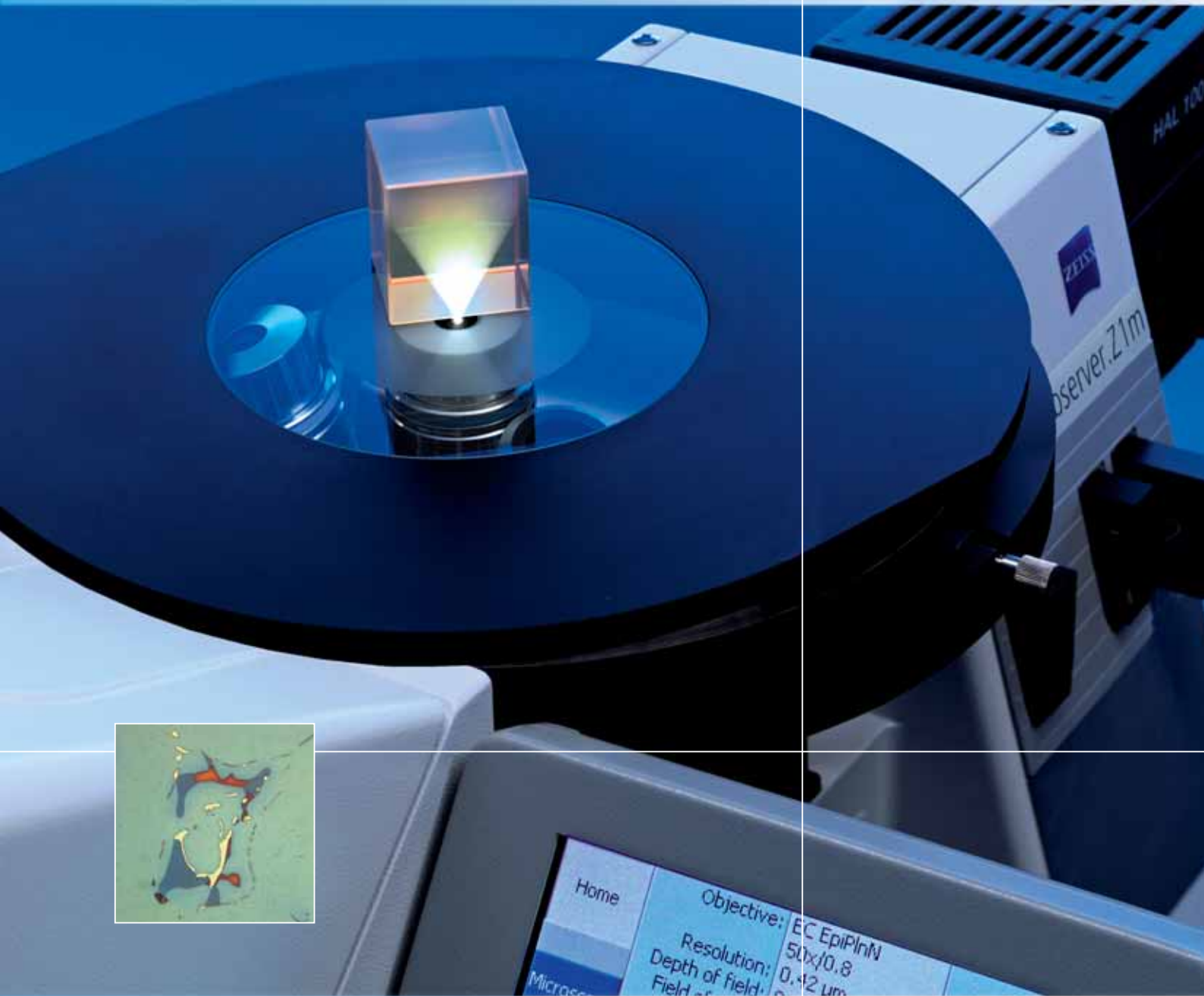


# Axio Observer

## Precise Analysis



**Ahead of Its Time: the Next Generation  
Inverted Microscope for the Investigation,  
Development and Analysis of Materials**



We make it visible.

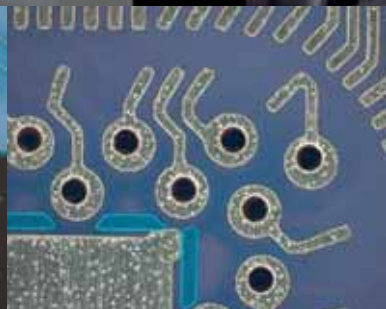
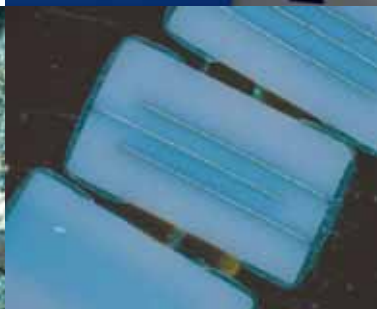
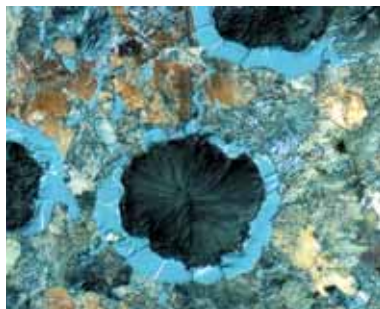
# The New Pioneer in Materials Microscopy: Axio Observer

Why should first-class optics need to be redesigned? Why should an intuitive operating concept be made even easier? Why should a high-performance microscope system be pushed to new limits? The answer: Because today's standards will no longer be acceptable in industry and academic research tomorrow. Because new developments are governed by accelerating investment cycles, increasingly exacting quality requirements, miniaturization, and the pressure to reduce costs.

The generation leap needed in high-level materials microscopy has now been made: Here is a new research and analysis platform which will meet your challenging demands of today and tomorrow. Features include:

- New optics providing optimum resolution and contrast
- Innovative touch screen display operating concept
- Automatic Component Recognition (ACR)
- Enhanced modularity for ever changing applications
- Reproducibility and stability
- Three stand versions: Axio Observer.A1m, Axio Observer.D1m and AxioObserver.Z1m – from the economical entry level to top-end performance

Axio Observer from Carl Zeiss. Materials microscopy at its best.



# Axio Observer



# Superior Definition and Contrast: the Leap in Optical Performance

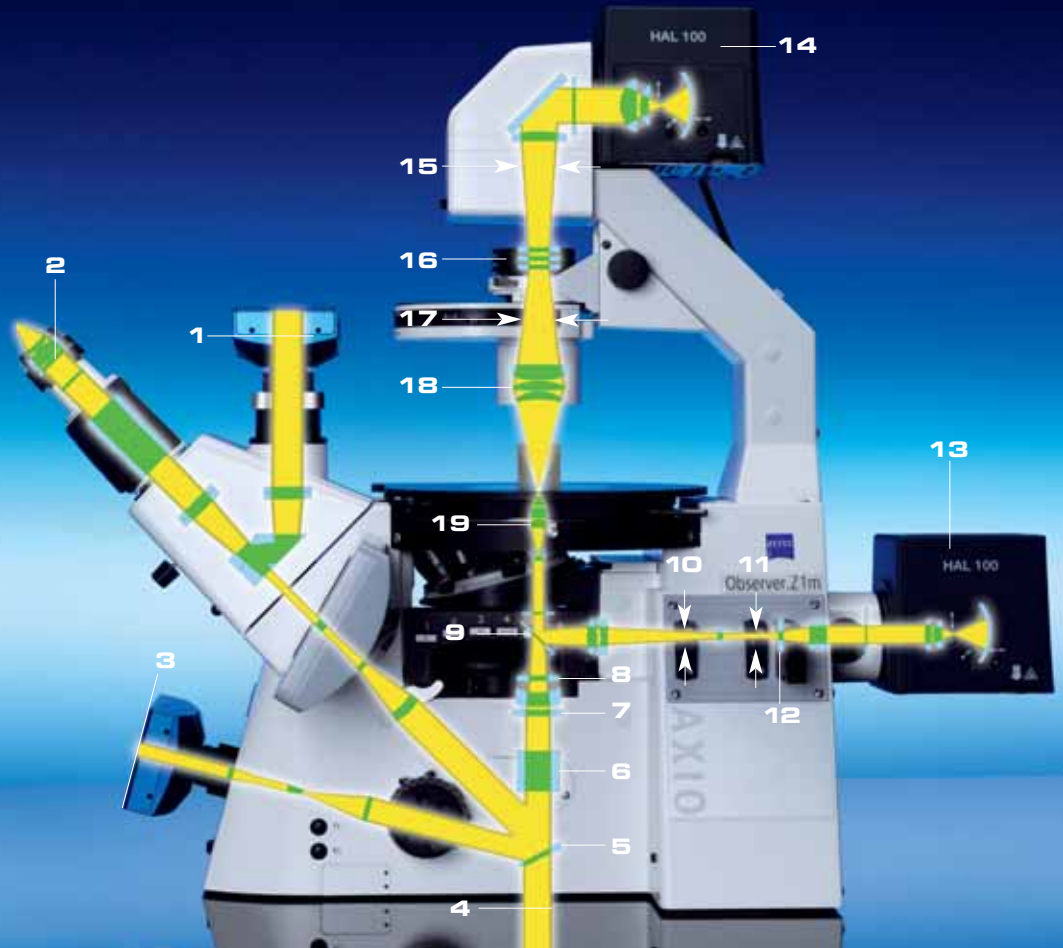
Axio Observer boosts high-end materials microscopy by unprecedented optical performance. With extremely low light scattering and surprisingly high contrast, it provides distinctly more information content with the high quality images it generates. Carl Zeiss has redesigned and optimized the entire optics of Axio Observer. The beam path has been apochromatically corrected so it brings out the full power of the Carl Zeiss objectives adding brilliant quality to all contrasting methods.

## Setting new standards: the apochromatic beam path

With apochromatic correction, the latest generation of Carl Zeiss beam path optics sets new standards. It gives Axio Observer images unprecedented, uniform brilliance. Homogeneous illumination across entire viewable fields. And, most importantly, a high degree of contrast. Thanks to the new design, light scatter in the reflected-light path is drastically eliminated. Seeing your specimens in brilliant contrast and aberration-free – with all objectives, and with all methods, whether brightfield or darkfield – may make you believe you have new eyes.

### Beam path

- 1 Intermediate image plane, trinocular tube
- 2 Eyepiece
- 3 Intermediate image plane, front port
- 4 Intermediate image plane, base port
- 5 Beam path switch: base port/front port/visual obs.
- 6 Side port prisms
- 7 Tube lens
- 8 Analyzer
- 9 Reflector module
- 10 Field diaphragm
- 11 Aperture diaphragm
- 12 Filter slider
- 13 HAL lamp
- 14 HAL lamp
- 15 Field diaphragm
- 16 Polarizer
- 17 Aperture diaphragm
- 18 Condenser
- 19 Objective







1. Zinc with deformation twins, 200x magnification, polarized light
2. Gray cast iron with GJL flake graphite, 500x magnification, brightfield

Micrographs courtesy of University of Applied Sciences, Aalen, Germany

### New level of contrast in all methods

The effects of Axio Observer's apochromatically corrected reflected-light beam path immediately catch the eye. In brightfield, with better homogeneity and color fidelity. In darkfield, with a black background that makes even the finest structures come out. The microscope offers all relevant methods in transmitted and reflected light: brightfield, darkfield, polarization, DIC; plus C-DIC and fluorescence in reflected light. Method change is especially fast and convenient with the motorized stands. When you select the motorized diaphragms, Axio Observer automatically adapts the settings.

H = Brightfield, D = Darkfield, DIC = Differential Interference Contrast, C-DIC = Differential Interference Contrast in polarized light, Pol = Polarization, LD = Long Distance

### Objectives of higher image quality

Carl Zeiss objectives are distinguished by a minimum of scattered light and reflections, better transmission and greater homogeneity. Axio Observer's apochromatic illumination concept brings out these quality characteristics to the fullest extent. The result: images of superior quality. The objective series available for this powerful materials microscope are tailored to match different requirements and applications – from the economical and flexible to the sophisticated and high-resolving.

### Eiplan

Manufactured with achromatic correction and low strain, the objectives of this economical series permit DIC of convincing quality and produce images that are flat within a diameter of 23 mm in the intermediate image plane. Available in H, HD and LD versions.



### EC Eiplan-Neofluar

These extra-high-contrast objectives are perfect for the rendition of finest color and structure details. Made with sophisticated correction and low strain, they permit brilliant C-DIC and produce a flat image field of 25 mm. Available in DIC, HD, C-DIC, Pol and LD versions.



### EC Eiplan-Apochromat

The finest objective series Zeiss offers, with the best correction and the highest numerical aperture, for example, the EC Eiplan-Apochromat 20x/0.60. These objectives are most suitable for the imaging of finest color and structural details in the submicrometer range.



For further information, please visit [www.zeiss.de/objectives](http://www.zeiss.de/objectives)

# Efficiency You Can Rely on – No Matter which Method

Advanced to better match practical requirements, Axio Observer offers a multitude convenience for the various contrasting methods: Automated components for the reflected-light beam path, a new reflector turret, automatic control of contrast and illumination – innovative details that relieve you of many operating steps, making sure you always have the correct setting selected.

## **The 6-place reflector turret, motorized for convenience**

The new motorized reflector turret with six filter places offers a high degree of flexibility and an added measure of operating convenience. The Push&Click reflector modules can be exchanged in virtually no time, and – starting with the Axio Observer generation – the complete turret can easily be replaced without assembly work. The letters ACR\* designate the new comfort in materials microscopy. ACR automatically reads and recognizes the reflector module, whereupon the microscope configures itself accordingly.

\* Automatic Component Recognition. Available for Axio Observer.Z1m.

## **The automated reflected-light beam path ensures constant imaging conditions**

Contrast and illumination in Axio Observer are controlled automatically. The motorized aperture and illuminated field diaphragms keep imaging conditions and thus reproducibility constant. Objective-specific diaphragm settings can be saved 1:1 and conveniently restored at any time. The same applies to the lamp voltage – save it separately for each contrasting method and objective, and rest assured that brightness in the eyepieces or the camera is always the same.

## **LED, the economically superior illumination principle**

Axio Observer's new LED illumination has a number of advantages: no need to adjust the lamp filament, and an extremely long illumination lifetime. This is decisive especially for routine laboratories, where every downtime needed for lamp change costs time and money. LED illumination is particularly suitable for reflected light with brightfield, DIC and C-DIC.



## **Reflector turret**



*A matter of seconds: simply exchange reflector modules  
without demounting the reflector turret.*

AlCu alloy, 20% Cu concentration gradient  
Panorama micrograph, AxioVision, brightfield reflected light.  
EC Epiplan-Neofluar 5x/0.13 Pol

Claudia Wasmund, Institute of Materials Science, University of  
Technology, Darmstadt, Germany



### Correct settings made automatically: the contrast manager

Dependable and time-saving, the contrast manager of Axio Observer sets all necessary components automatically and correctly. This saves you several steps on the way to the optimum result – you simply select the contrast, nothing else. The same convenience is effective when you change magnifications.

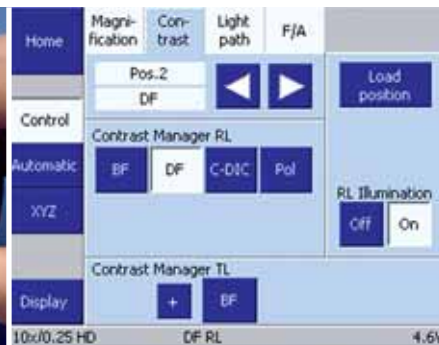
### Efficient protection and more: the light manager

Convenient and comfortable for your eyes in direct observation, the light manager of the Axio Observer generation is more than an efficient protection against excessive light intensities. Both in reflected and transmitted light, it correctly adjusts the light intensity as you change the magnification.

### LED illumination



### Contrast manager



### Light manager





# Convenience Meets Intelligence: the New Operating Concept

**Axio Observer sets new standards of operating convenience and efficiency. An intelligent operating concept integrates the entire workflow, from planning to monitoring to analysis. Consistent and well engineered, it includes direct hands-on operation as well as remote control. A concept that lets you tap the immense performance potential of this innovative high-end platform in the most economical and reliable way.**

## **Enhanced overview and certainty: the new displays**

The new level of operating convenience materializes in a touchscreen TFT display placed next to the motorized Axio Observer.Z1m stand. It boosts the efficiency of the workflow and the certainty of your control actions, and provides a perfect overview. Consistently combining control and monitoring, this compact unit is unique in materials microscopy. With extremely straightforward menu logic independent of the PC you can control the entire microscope. Activating individual functions or completely preset processes takes a mere touch with your finger tip. For Axio Observer.D1m stand, a compact, detachable LCD display has been designed, which

furnishes comprehensive status information. It is helpful for system configuration and displays all settings – objectives, contrasting methods, and magnification.

## **Maximum freedom of work organization: the docking station**

Perfectly integrated in your workflow, the docking station offers you every freedom to control the motorized microscope stand as your application requires: via PC, or completely by remote control. This is relevant wherever access to the microscope is difficult or impossible, or where your specimens need constant environmental conditions. The combination of all controls in a compact unit permits access to the complete menu logic of the TFT, plus all controls for specimen positioning. Five pushbuttons on the focusing knob can be freely assigned to functions of your choice.



*Safety is a prime concern with Axio Observer. For example, all settings can be protected by a password.*

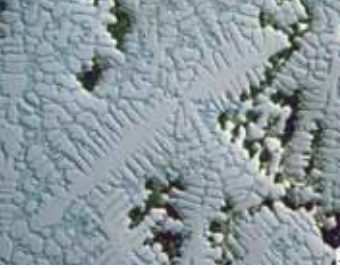
## **Docking station**



*The TFT display, whether on the stand or in the docking station, provides transparent, menu-controlled operation and configuration.*



# Workflow



CuP alloy, DIC, 100x magnification

Micrograph courtesy of University of Applied Sciences, Aalen, Germany

## Convenience does not stop short of the manual controls

You need not let go of the focusing knob to reach the other controls of Axio Observer. The freely assignable pushbuttons on the ring around the focusing knob can be operated blindly, so you can control the entire microscope without taking your eyes off the eyepieces. Before you start your examination, make use of another practical detail, the focus stop: Set to the maximum permissible approach between the objective and the specimen, it efficiently protects both.

## ACR - the intelligent highlight of the new microscope generation

Appreciable time saving, reduced risk of faulty operation, and more convenience – these are the benefits of Automatic Component Recognition (ACR). This Carl Zeiss innovation automatically reads which reflector module and which objective you have fitted to the microscope, and updates the system configuration accordingly. A feature that is

*Distinct advantage for the convenience and certainty of operation: Automatic Component Recognition identifies objectives and reflector modules.*



ideal in everyday work, especially if the modules are alternately used on several microscope stands.

## Comfortable posture with the ergonomic viewing tube

With its 50 mm height adjustment and an ergonomically ideal, fixed 25° viewing angle, the Ergo tube allows you to use your Axio Observer in a comfortable posture, reducing fatigue in long working sessions.

## Freely positionable LCD display



## Ergonomic viewing tube



*LCD display, ergonomic tube or push-button ring: the entire operating concept of Axio Observer is designed for a fast, convenient workflow.*

## Focusing knob with pushbutton ring



# **Just Superior: the Axio Observer Analysis System**

Thanks to its easy operating principle and its high performance, the Carl Zeiss AxioVision microscope software is unequalled worldwide. It is consistently modular and can be expanded to suit varied levels from a basic version to sophisticated special configurations. Together with Axio Observer, AxioVision ensures that you will be able to cope, with changing tasks and applications for a long time to come.

## **AxioVision combines simple operating strategies with all analysis functions**

The powerful software from Carl Zeiss has a number of convincing advantages:

- Easy user guidance
- Freely configurable working environment
- Reproducibility of measurements
- Easy creation of complete process flows
- VBA interface for individual programming
- Carl Zeiss ZVI Imaging Format linking images and shooting parameters

**Panorama**

Formation of  
overview images

**MosaiX**

Automatic scanning  
of large surfaces

**Extended Focus**

Expansion of depth of  
focus

**Time Lapse**

Acquisition of image series  
over time

**Autofocus**

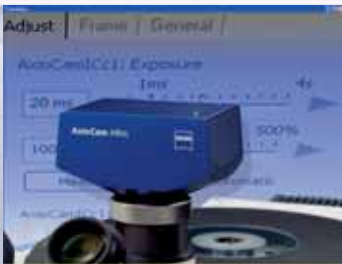
Automatic  
focusing

**Z-Stack**

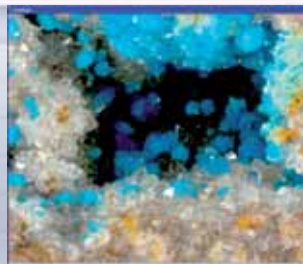
Acquisition of image  
series from different  
focus positions

**Image Acquisition**

Imaging with video and digital cameras,  
microscope control



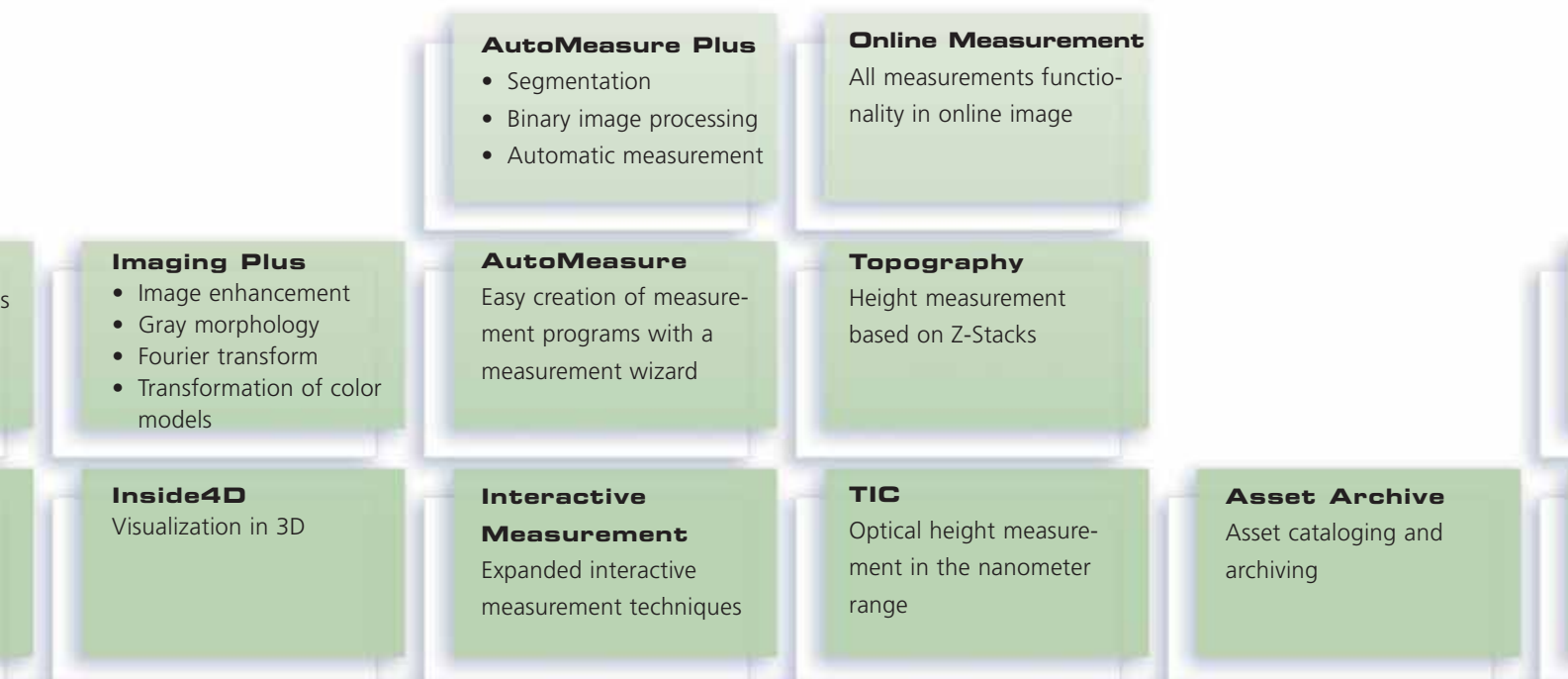
**Image Acquisition**



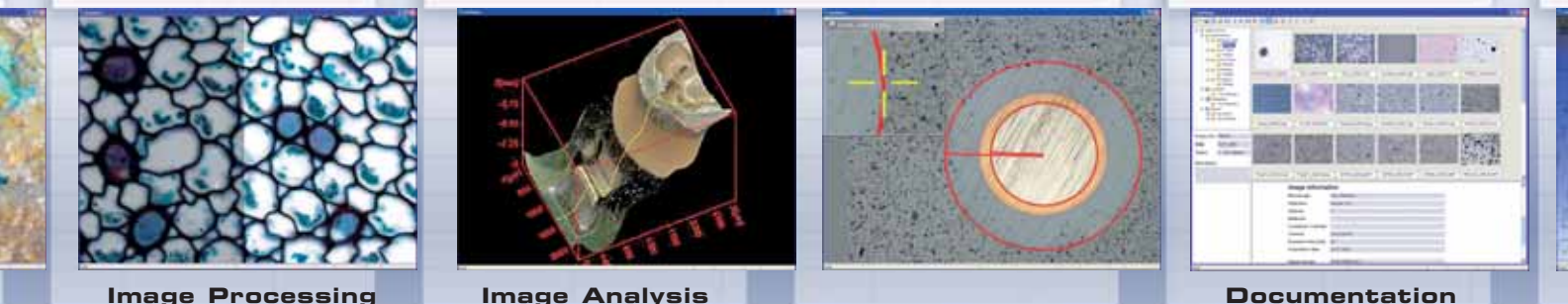
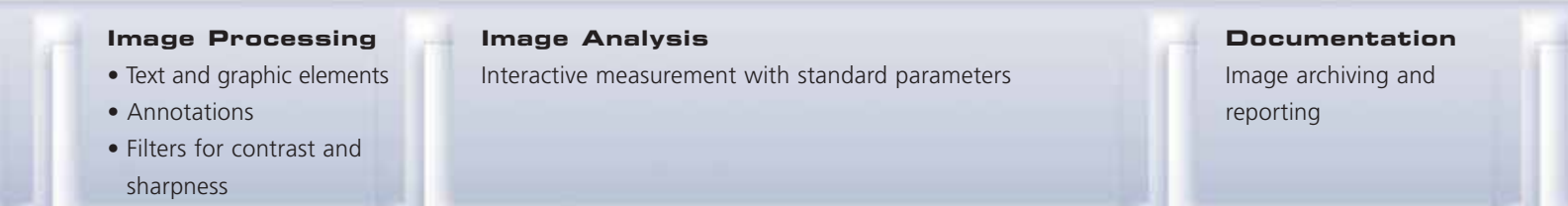
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## Modules



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## Basic program

# AxioVision

If you do not have the time to create your own software configurations but need solutions tailored to specific tasks, you can find them in AxioVision. For almost any application. Already the basic module comprises all essential functions such as acquisition, basic image processing, image analysis, documentation, configuration, and camera and microscope control. With a broad spectrum of supplementary modules and application solutions, AxioVision can be adapted to growing requirements – easily, quickly and economically. Carl Zeiss continuously adds new, application-specific solutions to the range. The user-friendly design has made AxioVision the world's leading imaging software.

**VBA**  
Programming environment

**Graphite**  
Analysis of form and size of graphite particles

**Commander**  
Recording and automatic execution of work steps

**Grains**  
Grain size analysis

**Multiphase**  
Automatic measurement of particle sizes and volume shares

**NMI**  
Analysis of the content of non-metallic inclusions in steel according to international standards

**Configuration**  
Customization of user interface

**Calotte Grinding Measurement**  
Coating thickness measurement

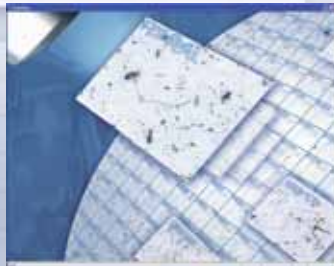
**Particle Analyzer Projects**  
Project management for particle analysis (VDA 19, ISO 16232, ISO 4406)



**Configuration**



**Multiphase**



**Particle Analyzer**

## Application solutions

# True Excellence Shows up in the Details: the System Components

Versatile and modular design to suit your diverse applications are not the only benefits you can expect of the research class of Carl Zeiss materials microscopes. In addition, you have the freedom to choose among a spectrum of high-performing components to configure the version that meets your requirements in the best and most economic way. You can rely on the performance of an expertly optimized overall system. And you can be sure that any future development can be integrated via standardized microscope interfaces.

## Convincing from entry-level to high-end models:

### Carl Zeiss microscope cameras

Modern cameras must satisfy requirements as varied as the application set in materials microscopy. Accordingly, the new Axio Observer microscope provides a variety of standardized optical-mechanical camera ports and software solutions, allowing you to use a wide spectrum of cameras, from digital consumer models to professional digital systems with C-Mounts. AxioCam, the Carl Zeiss

family of digital microscope cameras, comprises different performance grades and price brackets, one of which is certain to match your application. Fully integrated, all Carl Zeiss cameras can be directly controlled via AxioVision imaging software. Providing optimized live images at high speed, immediately calibrateable resolution, automatic exposure setting and more, they are powerful answers to your documentation problems.

### Stages for automated procedures

Axio Observer can be optioned with many different stages. A new motorized scanning stage has been specially developed for high precision tasks to be performed with Axio Observer. It is perfect, for example, for the automated recording of large specimens (mosaic images), but useful also with application software modules such as for the analysis of non-metallic inclusions.

**AxioCam ICc 1**

**AxioCam ICc 3**

**AxioCam MRc**

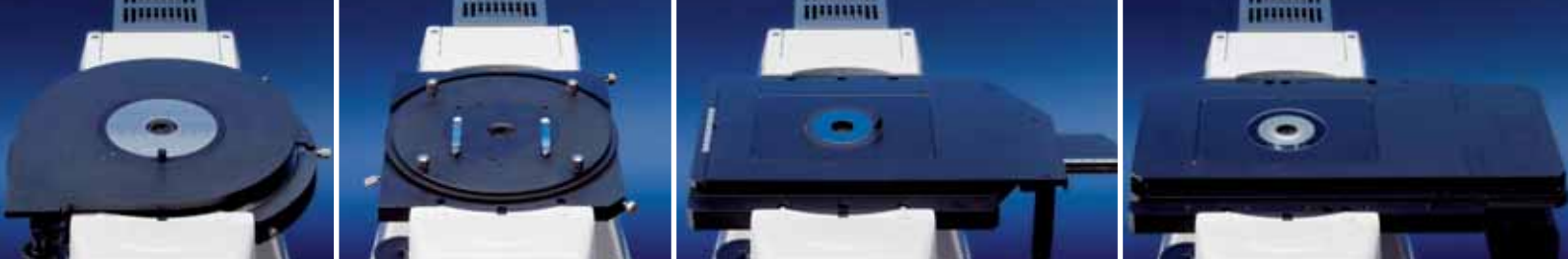
**AxioCam MRc 5**



*Left: 1.4 megapixels for routine applications  
Right: 3.3 megapixels for routine applications requiring higher resolution*

*1.4 megapixels for applications requiring higher image quality, especially for specimens with broad contrast range  
5 megapixels for documentation results of high resolution*





**90° rotating stage**

**Gliding stage**

**Mechanical stage**

**Scanning stage**

**Combined precision:  
90° rotating & mechanical stage**

Rotating through more than 90°, centerable and moving in X and Y, this new stage for Axio Observer allows precise alignment of your material specimens. During rotation, the focused specimen area constantly remains in the center rather than turning out of the field of view. This stage is particularly important for specimens having distinctly aligned structures. Examples: Rolled metal sheets, semiconductors, PCBs, components of geometrical shape, etc. And it is indispensable for distinguishing between anisotropic and isotropic constituents of structure in polarization work.

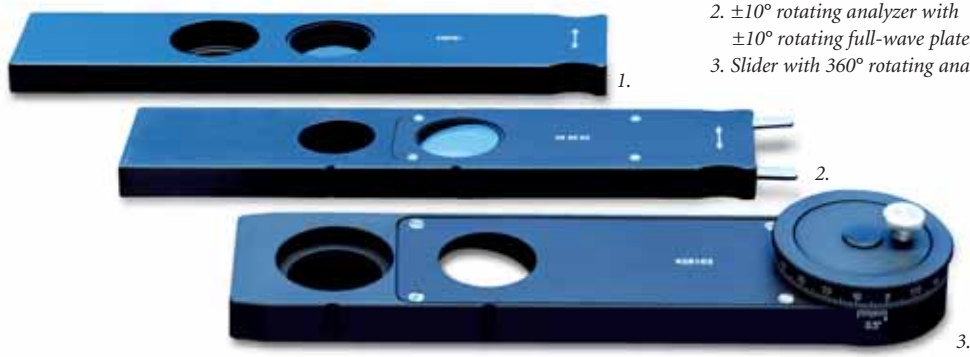
**Analyzer sliders for every application**

Many different analyzer sliders are available for Axio Observer, including a fixed analyzer, a measuring analyzer rotating through 360°, and the most versatile model: a rotating analyzer with rotating full-wave plate. The range of options provides a high degree of flexibility to suit every application.

**Glass or metal stage inserts for the most exacting demands**

Glass inserts with their smoother surface are most useful for specimens of softer metals like copper, tin, brass, aluminum, beryllium or magnesium, which are susceptible to scratching when shifted about on the stage insert during observation. The strong point of Axio Observer's new metal inserts is their rigidity. The high-grade spring steel will not yield under loads, even if many samples have to be examined per day. Thus it is ensured that the optical reference plane is maintained and all parts of the specimen are in focus. Stage inserts for Axio Observer are available with different inside apertures matching standard specimen diameters, plus a 10 mm aperture for very small specimens.

**AxioCam HRc**



- 1. Fixed analyzer
- 2. ±10° rotating analyzer with ±10° rotating full-wave plate
- 3. Slider with 360° rotating analyzer

**Analyzer sliders**

Selectable resolution up to 3 x 13 megapixels for top quality and extremely high resolution at the very limit of what is technically feasible

# A Safe, Future-proof Decision: the Stand

Large and strong, the stand of Axio Observer combines flexibility with stability and thereby sets the new standard in materials microscopy. The choice between three microscope stand options is not a matter of weight class, but of specific microscope options, aimed at optimum functionality and economy for your materials microscope applications.

## Three stand models - three high-performance systems

With Axio Observer, you take a performance leap to the next generation of materials microscopy, irrespective of which stand forms the basis of your analysis platform. The three versions constitute three high-performance systems. Each of them is a stable platform on which you can face the growing requirements in materials development and analysis with competence and capability:

- **Axio Observer.A1m:** Thanks to the innovative beam path design, even the entry-level model will ensure excellent imaging results
- **Axio Observer.D1m:** In addition, this stand version offers coded and motorized components that can be read via the PC – for greater certainty in measurements and greater operating convenience
- **Axio Observer.Z1m:** This fully motorized stand expands the performance capabilities by motorized focusing (z control), ACR, TFT display and docking station. Currently the ultimate in operating convenience, flexibility and reproducibility available to materials microscopy

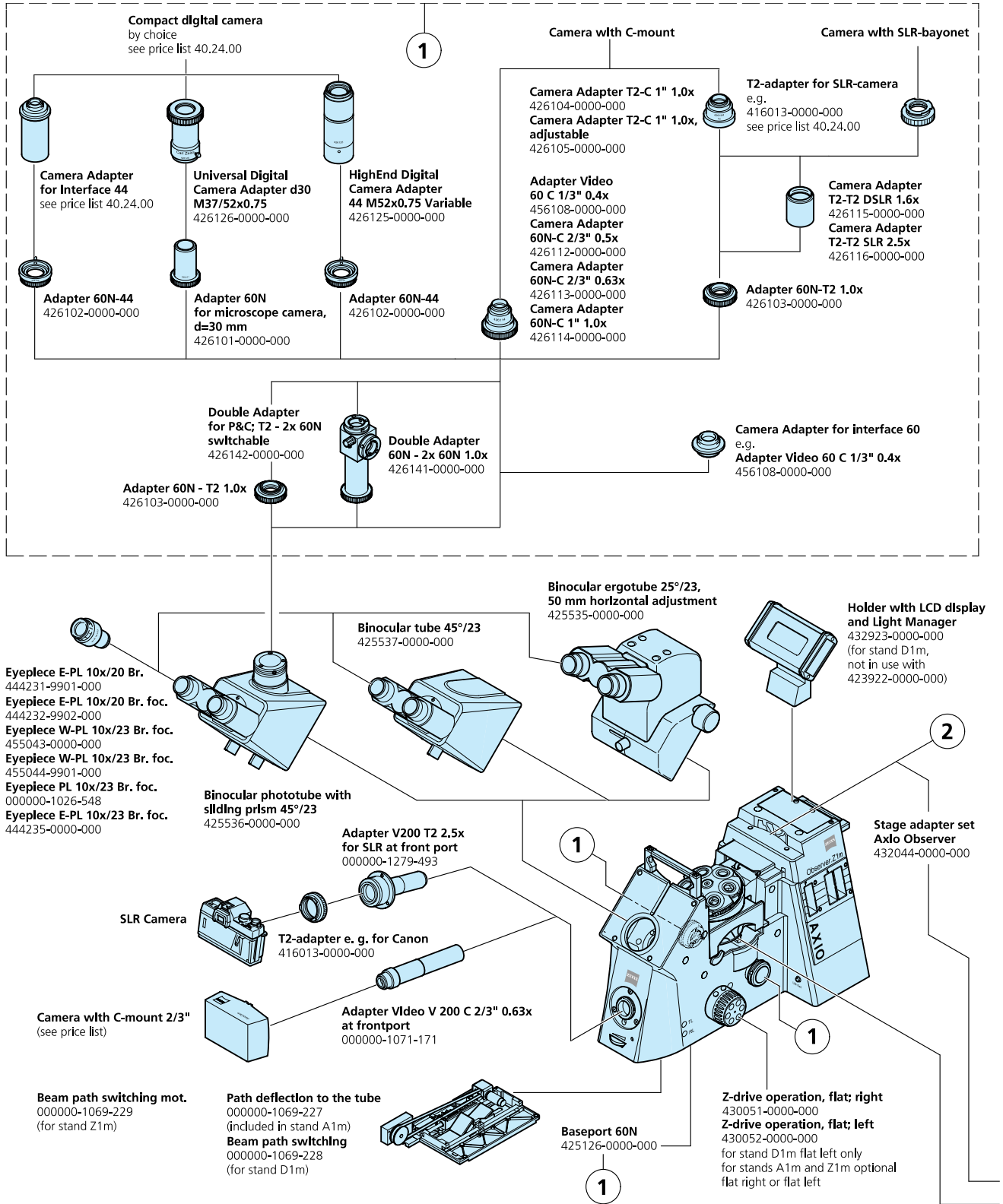
**Axio Observer.A1m**

**Axio Observer.D1m**

**Axio Observer.Z1m**

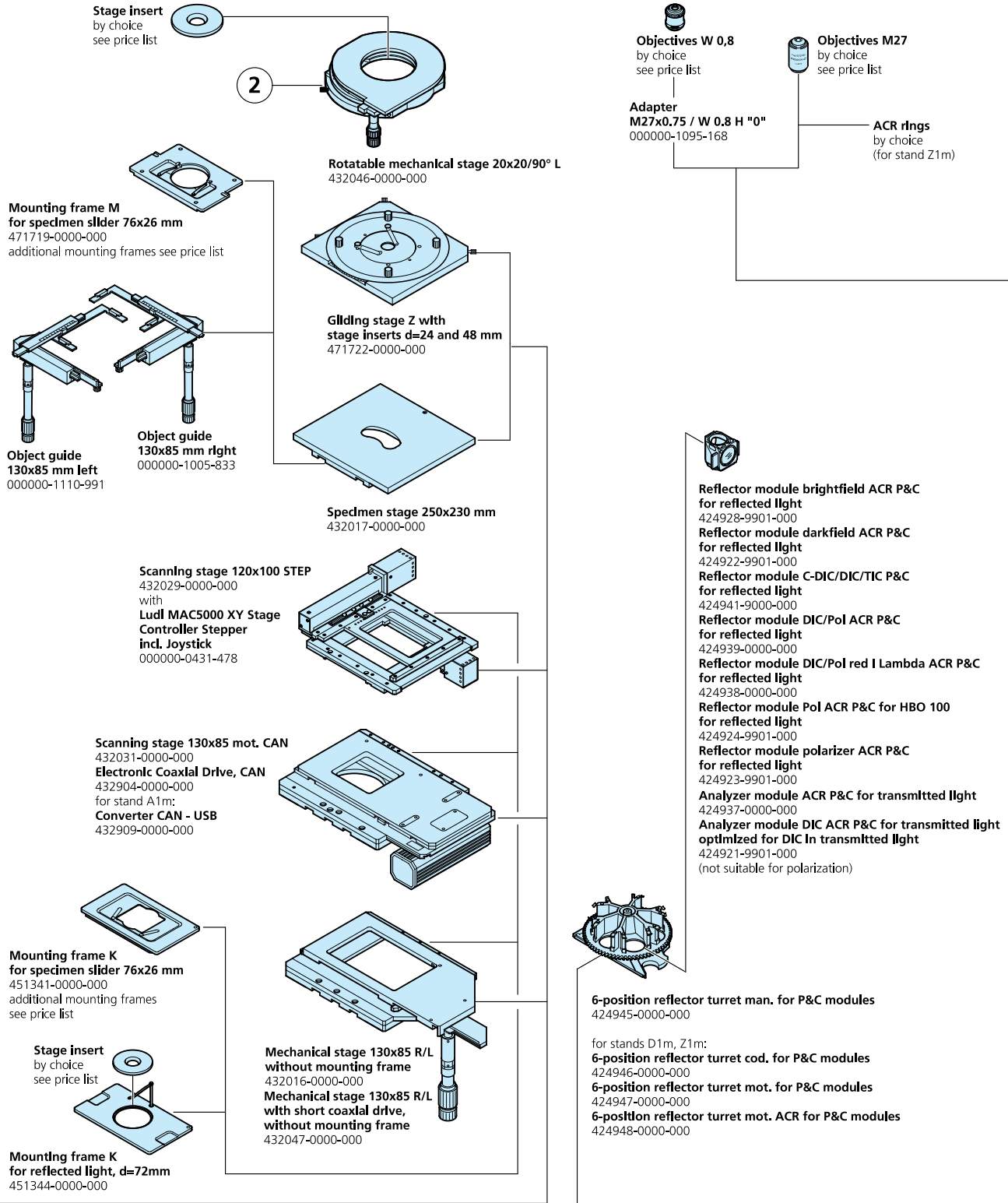


# System Overview Axio Observer MAT

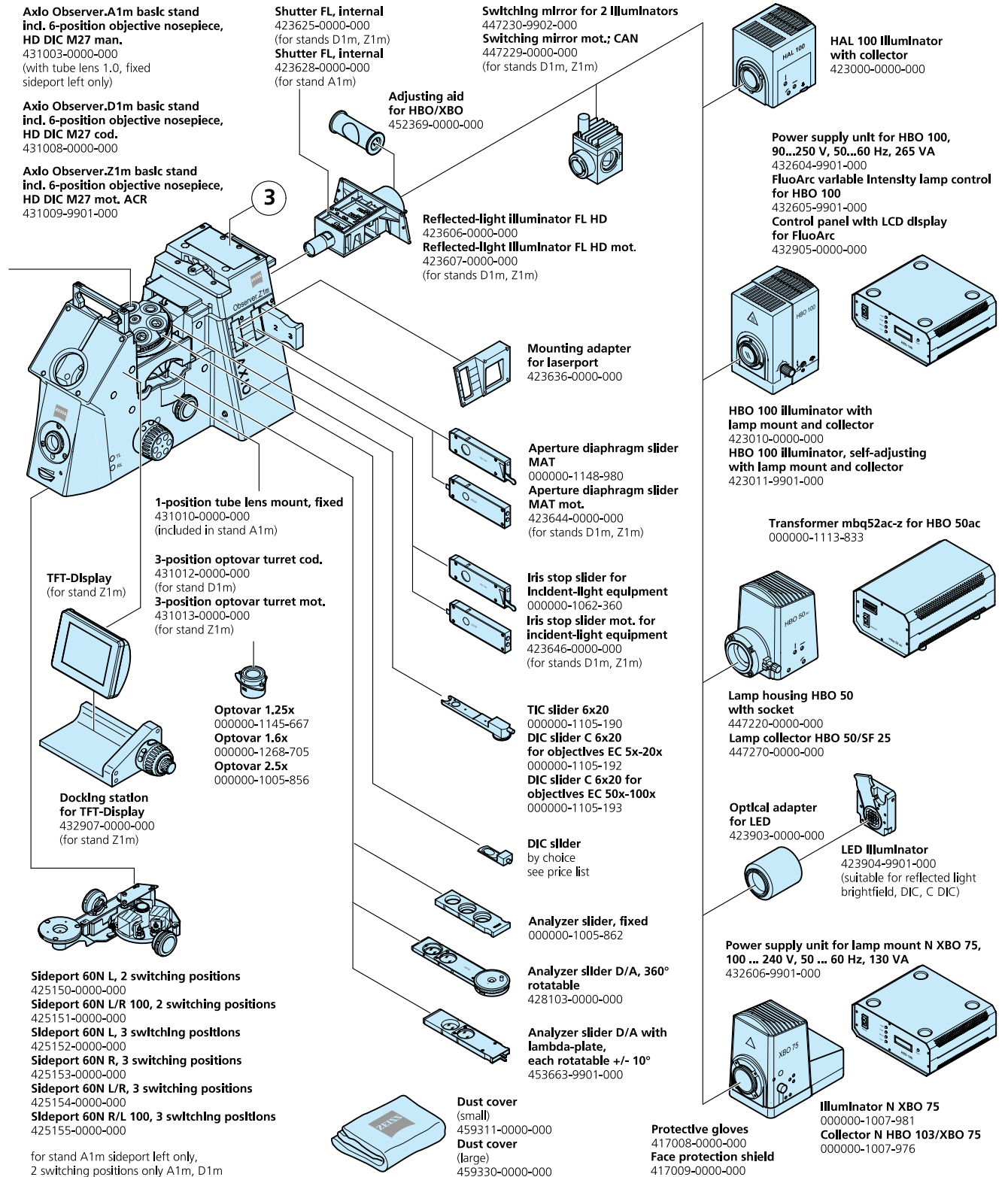


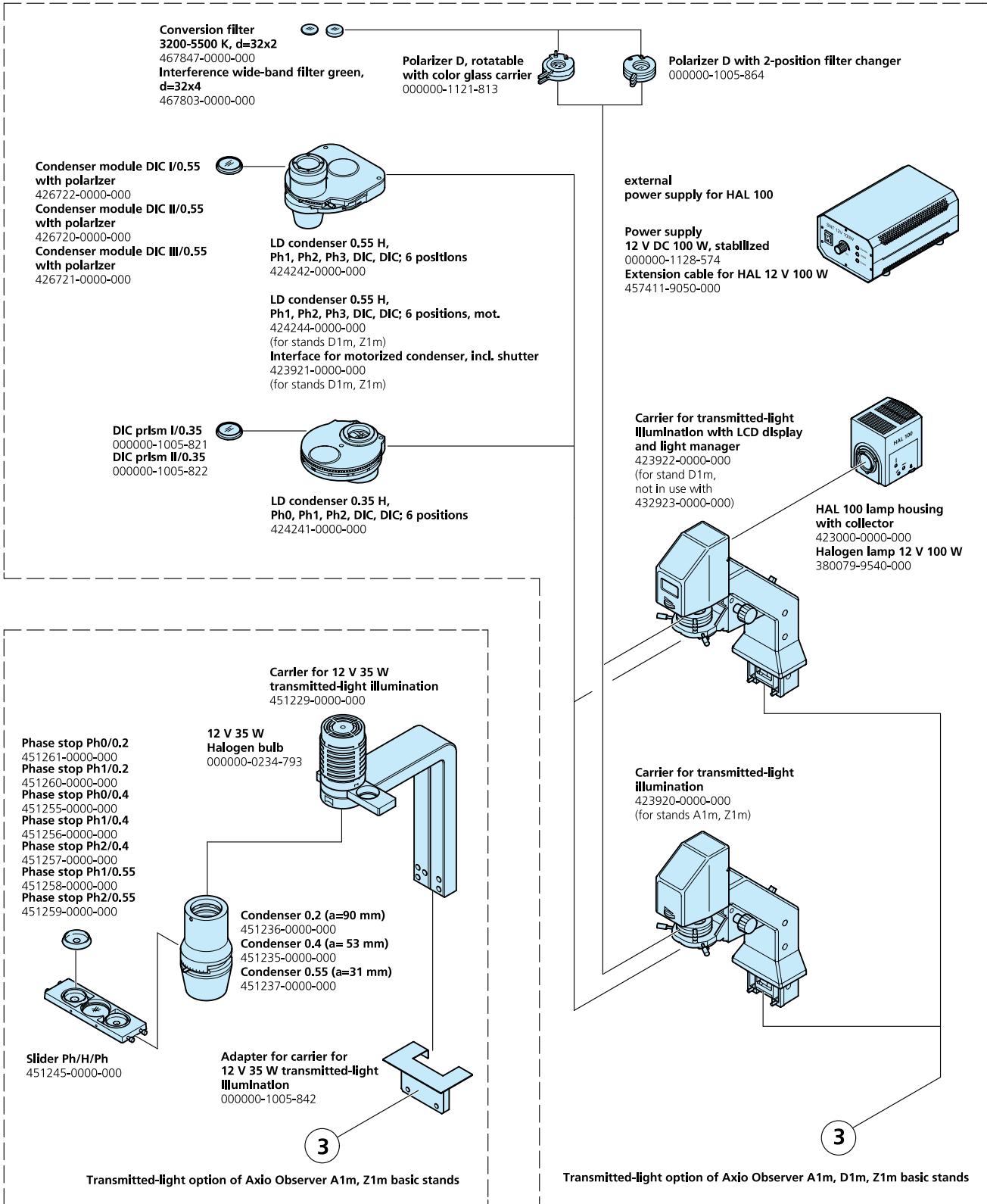


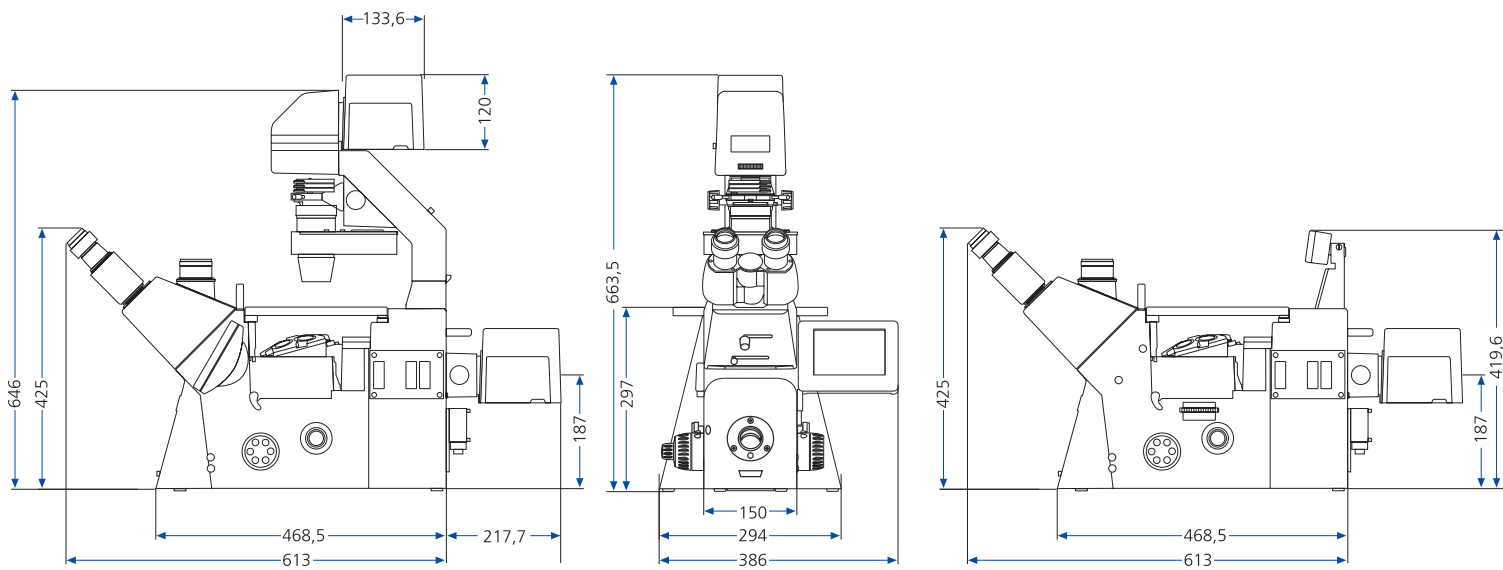
# System Overview Axio Observer MAT



# System Overview Axio Observer MAT







## Axio Observer

Equipment	Option	A1m	D1m	Z1m
Stand	manual	+	+	-
	motorized	-	o*	+
	readable from stand	-	+	+
Focus control	manual (2 mm / 0.2 mm)	+	+	-
	motorized	-	-	+
Power supply unit	external	-	-	+
	internal	+	+	-
Display	LCD	-	o**	-
	TFT	-	-	+
	docking station for TFT	-	-	o
Tube lens mount	1x	+	o	o
Optovar turret	3x, coded	-	o	-
	3x, motorized	-	-	o
Light manager		-	+	+
Contrast manager		-	-	+
Revolving objective nosepiece	6x HD DIC manual	+	-	-
	6x HD DIC coded	-	+	-
	6x HD DIC motorized ACR	-	-	+
Reflector turret	6x manual	o	o	o
	6x coded	-	o	o
	6x motorized	-	o	o
	6x motorized ACR	-	o	o
Reflected light	apochromatic manual	+	o	o
	apochromatic motorized	-	o	o
Reflected light diaphragm slider	manual	o	o	o
	motorized	-	o	o
Documentation	side port left	o	o	o
	side port right	-	o	o
	side port left / right	-	o	o
	front port / base port	-	o	o
Switching mirror for 2 lamps	manual	o	o	o
	motorized	-	o	o
Transmitted light	manual condensor	o	o	o
	motorized condensor	-	o	o

- = not possible  
+ = included in stand

o = optional  
o\* = optional: reflector turret, condenser and reflected light system  
o\*\* = holder with LCD display (432923-0000-000)  
carrier for transmitted light illumination with LCD display (423922-0000-000)



# Advantages

## Microscope class

- The new research-grade inverted materials microscope from Carl Zeiss
- Universally suitable for all applications in materials research and development
- The strong alternative with near-limitless specimen space

## New optics

- Apochromatic correction for unequalled contrast with all methods
- Consistently high brilliance
- Homogeneous illumination
- Broad range of special objectives for materials applications

## Methods

- Equipped for all relevant contrasting methods
- 6-place reflector turret for convenient change of reflector modules
- Automated components of the reflected light beam path, providing the highest level of reproducibility
- Contrast and light managers for automatically controlled microscope settings
- New LED illuminating concept, no alignment and no lamp change required

## Innovative operating concept

- New control and monitoring convenience through TFT or LCD display
- High flexibility of system control: stand, TFT or PC, or complete remote control via docking station
- Intelligently positioned manual controls

## Stability

- Peerless stability thanks to pyramidal design
- Designed for uncompromising reproducibility

## Analytical system

- Powerful AxioVision imaging software
- Modular expandability for all functions such as MosaiX, Panorama, TIC measurement, etc.
- Leading in confocal laser scanning microscopy in both reflection and fluorescence modes
- Completely integrated with the entire product line of Carl Zeiss microscope systems
- Wide range of digital cameras

## The extension concept

- High-performance microscopy with three stands made to measure
- High economy, long service life, future-oriented design for easy upgrade
- Broad spectrum of matched system components
- Open-architecture system allowing easy linking of external components
- Future-proof growth platform