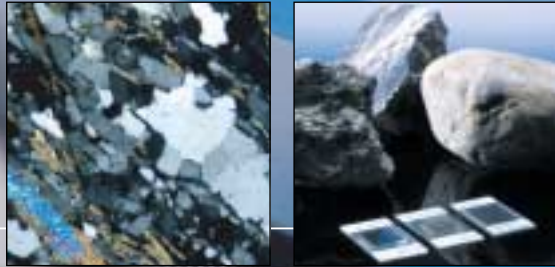


# Axioskop 40 Pol

**Clearly superior**



**The polarization microscope for research  
and routine**



# **Axioskop 40 Pol - focused on clarity**

The new specialist in polarization microscopy is here. A microscope focused on the examination of crystalline structures. Designed for use in both routine and research applications in fields such as:

- geology
- mineralogy
- crystallography
- ceramics/glass
- polymers
- textiles
- forensics

Produced in accordance with the highest Carl Zeiss standards of quality, providing superior value and performance. Equipped with many innovative features as well as all standard contrasting and measuring techniques in both transmitted and reflected light, thereby meeting the growing demands in polarization microscopy. More than ever before, you will find ergonomics, ease of use and simplicity built in to maximize your performance. Axioskop 40 Pol – the polarization specialist.

## Milestones

Many years of tradition and innovation in polarization microscopy – with exciting developments that set the standard in their time. Now a new microscope from Carl Zeiss is continuing the success story: the Axioskop 40 Pol, yet another milestone in research and routine applications.



*Mid-sized stand for mineralogy*

### 1878

Carl Zeiss in Jena produces the first standard polarization equipment for microscopes.

### 1891

Three new stands developed in Jena especially for mineralogy.

### 1912

Designed for training, routine applications and research – six new mineralogy stands from Winkel-Zeiss Göttingen.

### 1968

Amplival Pol – a microscope from Carl Zeiss Jena makes history. The first polarization microscope with infinity optics for reflected and transmitted light was originally selected by NASA to examine lunar rock.

### 1987

Axioskop Pol – the first polarization microscope with ICS optics in this category, developed by Carl Zeiss Oberkochen.

### 1995

Axiolab Pol – unique in its category with ICS optics and full range of accessories, including universal rotary stage. After the reunification of Germany, Axiolab Pol is the first polarization microscope to be developed jointly by the sites in Jena (former East Germany) and Oberkochen (former West Germany).

### 2002

Axioskop 40 Pol – the microscope from Göttingen sets new standards in polarization microscopy through a wealth of functionalities and innovative details.



*Amplival Pol*



*Axioskop Pol*



*Axiolab Pol*





# Axioskop 40 Pol



# A closer look at quality

The name Carl Zeiss stands for internationally renowned quality in optics. Quality that has been perfectly tailored to your applications, quality that you need in the demanding world of polarization microscopy. With Carl Zeiss standards such as ICS optics, Köhler illumination and the Light Trap in addition to innovations such as the new generation of EC objectives, which provide the most powerful performance on the market.

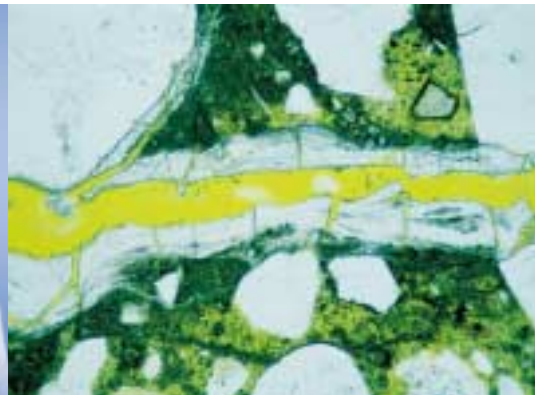
*Unique in this category: the 6 position nosepiece Pol with a position for darkfield and DIC.*

**Nosepiece\*\***

## **Polarization deserves the best: The optics**

New standards in polarization microscopy begin with uncompromising quality in optics. The modus operandi: strain-free. That is why Carl Zeiss offers you a broad spectrum of polarization objectives in various price and performance categories – tailored precisely to your requirements. CP-Achromats and Plan-Neofluars for transmitted light, Epiplans and Epiplan-Neofluars for reflected light, special objectives for immersion (oil, water, glycerin) or for large working distances (LD\* objectives). Axioskop 40 Pol is flexible: it can accept the new EC Epiplan-Neofluar Pol objectives. EC (enhanced contrast), the new generation of reflected light objectives from Carl Zeiss, provides you with unsurpassed infinity optics, color-fidelity, and stray light free images – as well as with exceptionally high resolution and sharp contrast. Low birefringent objectives are also available to increase the overall performance. Important, especially in polarization, is Axioskop 40 Pol's ability to center 5 objective positions to a 6<sup>th</sup> reference objective.

*Building material, gel between stress quartz, cracks dyed yellow, thin section, transmitted light-brightfield. Photo: Dr. E. Freyburg, Bauhaus-Universität Weimar, F.A. Finger-Institut für Baustoffkunde.*



\* LD = long distance

\*\* Nosepiece cannot be exchanged

# Axioskop 40 Pol

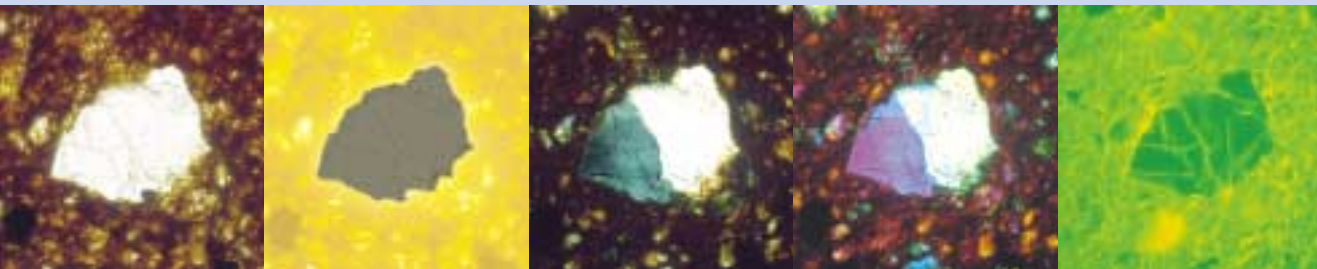
## 6 eyes see more: The nosepiece

In your work, speed is of the essence. Thanks to its 6 position centering nosepiece, the Axioskop 40 Pol saves you time-consuming changing of objectives – for example, when you switch between reflected and transmitted light. With a position for reflected light-darkfield and DIC. A crucial advantage if you want to work efficiently – and a unique feature in this category of microscopes. In addition, Axioskop 40 Pol provides you with a 5 position reflector turret, a feature not found on other polarization microscopes in this class.

## Quartz crystal in ordinary ceramics

*Leaders in reflected light polarization microscopy: the EC Epiplan-Neofluars. This new development in objectives from Carl Zeiss is based on the time-tested ICS optics and offers you unsurpassed quality in contrast and imaging.*

- Transmitted light-brightfield
- Reflected light-brightfield
- Polarization
- Polarization with  $\lambda$  compensator
- Epodye fluorescence





# Performance programmed to innovate

The polarization specialist Axioskop 40 Pol offers you the contrasting and measuring techniques you need to get the job done. From darkfield and DIC right up to circular polarization. For the classical areas of polarization and for recent applications in materials microscopy, such as the examination of plastics, magnetic materials, glass, ceramics and metals. There's more: Axioskop 40 Pol provides you with totally new Carl Zeiss techniques: Circular Differential Interference Contrast (C-DIC) and Total Interference Contrast (TIC). Two innovative optical techniques with crucial advantages for materials microscopy.

## **Your requirements dictate: Polarization and contrasting techniques**

What can you expect from a polarization specialist? Expertise in the techniques you need. In transmitted light: orthoscopy, conoscopy, brightfield, darkfield, DIC and phase contrast. And in reflected light: brightfield, darkfield, polarization and DIC right up to epodye fluorescence to detect cracks and voids. What else can you expect from a real specialist? Innovative solutions, where there used to be none. With the Axioskop 40 Pol, you've taken a big step forward in reaching your goals.

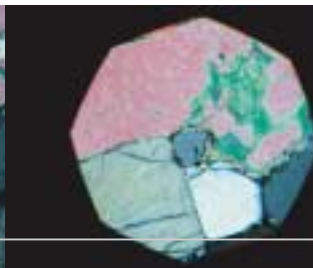
## **Pin hole diaphragm**



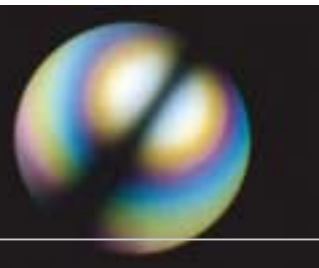
## **Conoscopy of small crystals**



*Step 1: orthoscopy, thin section of rock. Center: small olivine crystal.*



*Step 2: use of luminous field or pin hole diaphragm.*



*Step 3: Conoscopic image of the small olivine crystal, 2-axis.*

## **Linear or circular:**

### **Two types of polarization**

Axioskop 40 Pol provides you with a wide range of fixed polarizers for reflected and transmitted light. It also offers you another benefit-driven innovation: transmitted light circular polarization. The difference to today's largely linear polarization? Sample structures that were visible only in a certain direction can now be seen in their entirety – regardless of their orientation and without rotating the sample stage. The advantages are obvious, not only for microphotography of thin sections of rock but also for the examination of structures in plastics or strain distribution in glass with image analysis.

## **Emphasis on flexibility:**

### **The conoscopy module**

Easy to adapt to the nosepiece, exchangeable without tools, simple to retrofit at any time: the Bertrand lens module equips the Axioskop 40 Pol for crystal analysis. Small crystals up to 54  $\mu\text{m}$  can be examined with the pin hole diaphragm integrated in the base of the stand and the 50x/0.80 CP-Achromat objective.

## **C-DIC: High-contrast innovation**

Axioskop 40 Pol is the first polarization microscope that enables you to use an innovative contrasting technique: C-DIC. This technique also works in circular polarized light, similar to the circular polarizer D (for transmitted light). It offers you two signifi-



Polarization type of light		Rotation of microscope stage				
		0°	45°	90°	135°	180°
Specimen	Zircon linear					
	Zircon circular					
	Muscovite linear					
	Muscovite circular					

*Optical anisotropic crystals in linear and circular polarized light during orthoscopic and conoscopic examination.*

cant benefits. The first benefit: C-DIC can be operated on every normal Pol nosepiece with the EC Epiplan-Neofluars – simply slide it into the compensator slot of the Axioskop 40 A Pol (transmitted and reflected light). There are two sliders available for this range of objectives: one for the magnifications 5x, 10x and 20x, one for 50x and 100x. The second benefit: optimal contrast for a fixed image section can be attained simply by adjusting the knob – an outstanding plus when it comes to image documentation and analysis.

#### **Precision is standard:**

##### **The measuring techniques**

Perfect performance in measuring techniques – from simple measuring and counting via the ball-bearing rotary stage right up to the measurement of path differences and strain conditions. All made possible by a wide range of compensators measuring from 0 to 30  $\lambda$ . Axioskop 40 Pol is designed with flexibility so that other techniques such as microhardness testing and thermal microscopy can be added.

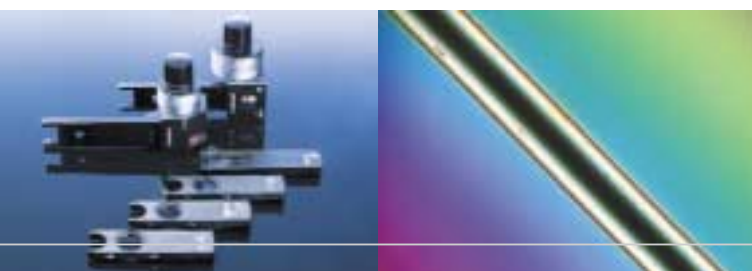
#### **Non-contact measuring: The new reflected light interferometer TIC**

The circular dual-beam interferometer makes it possible to measure surface topography and roughness. This technique is useful in all areas where surface texture plays an important role in product quality. The measuring range extends from 50 to 5000 nm (0.05 – 5  $\mu$ m). Important: this technique can be used with all objective magnifications.

#### **Very attractive: The special module for magnetic domains**

Magnetic domains, an area of increasing significance in new materials and data storage devices, can be imaged by the Kerr effect. A sophisticated method – previously restricted by technical limits – now made available for the first time by Carl Zeiss for routine use. Thanks to the new thermally protected module, the high-energy beam of the mercury lamp HBO 103 can be used for consistently good polarization contrast.

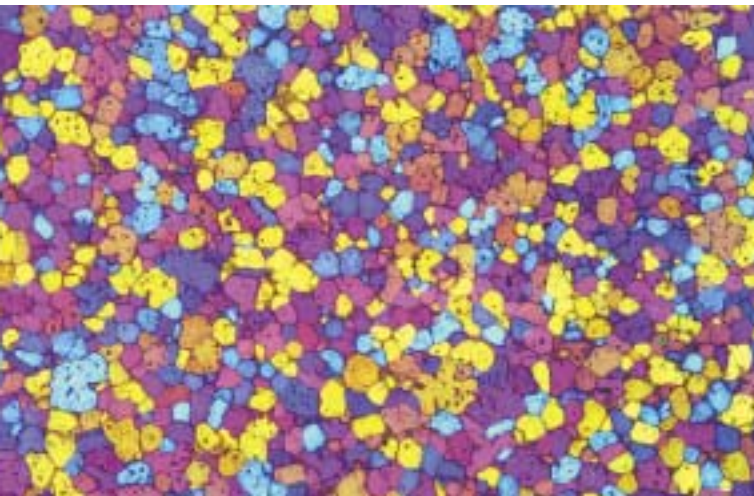
## **Compensators**



Compensators for all applications, areas ranging from 0 to 30  $\lambda$ . Nylon fiber, polarization, measuring compensator 0 – 5  $\lambda$  Berek.

# Unequalled in practice

Designed to meet the demands of polarization microscopy more effectively and simply than ever before: the Axioskop 40 Pol is made for daily work. This is clearly evident in many details – from the elegant stand design, which provides everything you require in terms of ergonomy and operating comfort, right up to the modular construction for precise solutions that can grow with your needs.



*Magnesium alloy AZ 31, reflected light polarization with  $\lambda$ -plate.  
Photo: E. Schabberger-Zimmermann, Gießerei-Institut der RWTH Aachen.*

## **Operating comfort: Priority in design**

Fast, easy, precise, safe: these are the demands you make of your microscope in the lab – particularly when it comes to complex applications. With its many sophisticated details, the Axioskop 40 Pol meets all these requirements. For example, the clear and simple arrangement of the operating components near the focusing drive. Or the focus stop function to protect the specimen from accidental contact with the objective. The large specimen area and the fact that the objective points away from the user for easy access to the specimen. The list continues: changing easily between reflected and transmitted light via a simple switch, the Push&Click reflector module for ease of exchange, adjustable ergonomic binocular viewing and more.

## **For your growing needs: Modularity**

The modular structure of the Axioskop 40 Pol provides you with the flexibility you need to assemble your polarization microscope so that it meets the numerous demands of your daily work as functionally and as cost-effectively as possible. As a transmitted light microscope (Axioskop 40 Pol) or as a combined transmitted light/reflected light one (Axioskop 40 A Pol). In addition to contrasting and measuring techniques, this versatile component system contains fluorescence modules and the Bertrand lens system for conoscopy, both easily retrofittable without any tools. The Axioskop 40 Pol can be easily configured to meet all your present and future needs.

## **Minimum expansion**

### **Step 1**

Transmitted light orthoscopy  
Basic model with brightfield optics

### **Step 2**

Transmitted light orthoscopy  
Basic model with strain-free optics

### **Step 3**

Transmitted light orthoscopy + conoscopy  
Measuring techniques

# Axioskop 40 Pol

- Small rotary stage:* clamping, can be rotated 360°, angle reading 0.1° precise.
- Mid-sized rotary stage:* ball-bearing, optionally adjustable 45° stops, can be rotated 360°, angle reading 0.1°.
- Large rotary stage:* ball-bearing, clamping and optionally adjustable 45° stops, can be rotated 360°, equilibration, angle reading 0.1°.



Small rotary stage

Mid-sized rotary stage

Large rotary stage

## Stages, tubes, lamps:

### The components

Tailored to your needs: The Axioskop 40 Pol accepts a wide range of stages, tubes and lamps. From a simple rotating stage to a larger, ball-bearing, circular rotating stage with precision click stops and XY translation. From the intermediate tube Pol with suspended crosshair, focusing Bertrand lens and iris diaphragm for convenient conoscopy up to the ergotube and binocular tubes of research microscopes. From standard illumination – 100 W halogen in reflected light, 35 W halogen in transmitted light – all the way up to extremely powerful xenon and mercury lamps. Axioskop 40 Pol: for outstanding operating comfort, a wide range of accessories and superb image quality.

## Maximum expansion

### Step 4

Transmitted + reflected light  
Orthoscopy + measuring technique

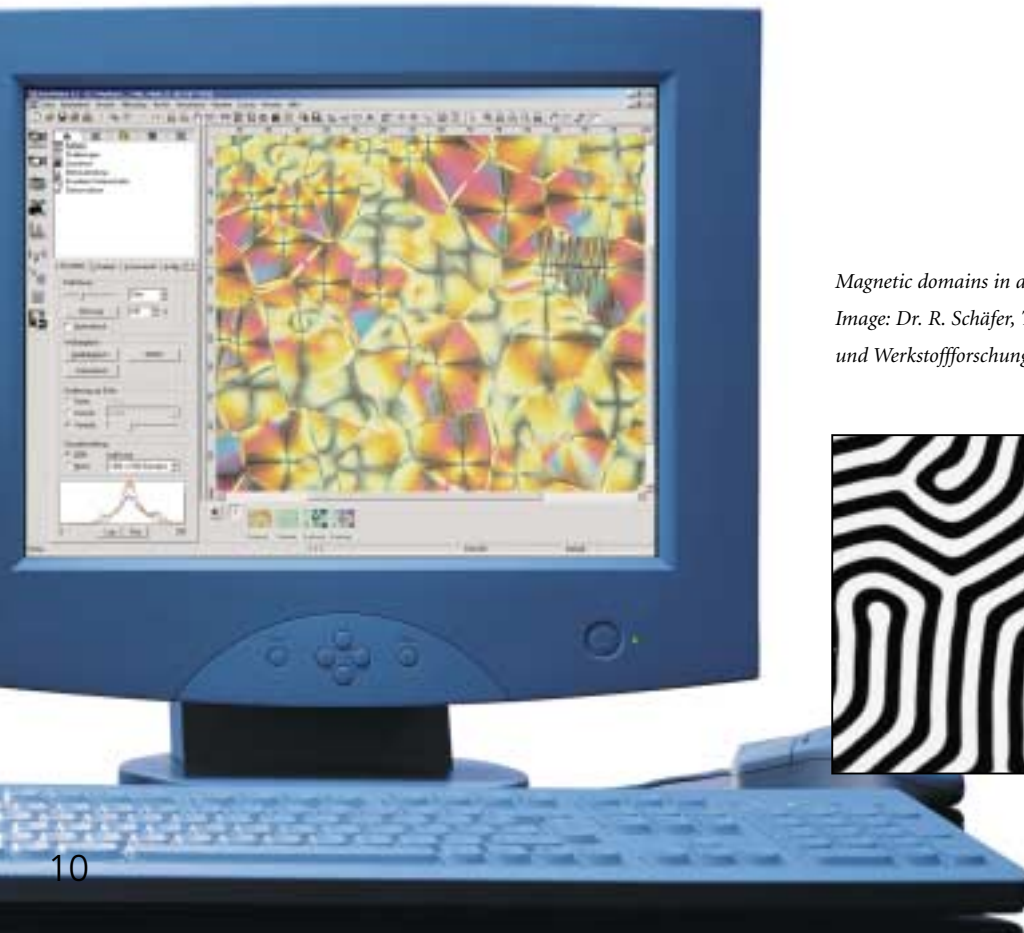
### Step 5

Transmitted + reflected light  
Orthoscopy + conoscopy  
Measuring techniques

## Unsurpassed as a team

**A great team player: Axioskop 40 Pol is a microscope that can be easily integrated into camera and image processing systems. In addition, it is a superb example of the Carl Zeiss philosophy, which can be summarized as: We provide our customers with integrated solutions for their work – while consistently meeting the highest standards in our microscopes, cameras, software, components and service.**

*Perfect digital imaging platform: Axioskop 40 Pol, AxioCam and AxioVision.*

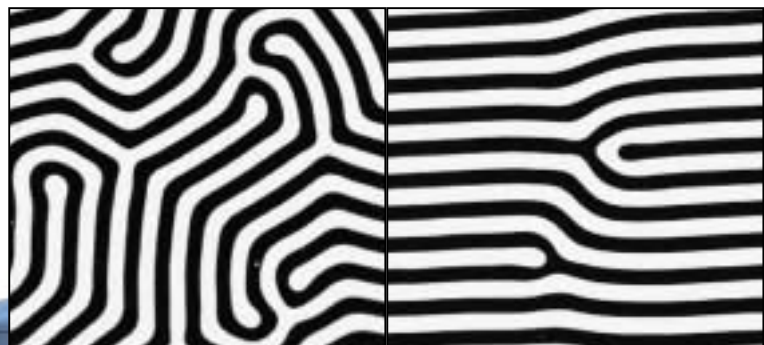


### **Cameras: A question of need**

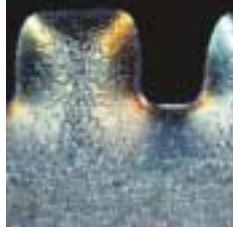
The phototube of Axioskop 40 Pol can accept various types of cameras – both analog and digital. The AxioCam digital camera family is ideal for polarization. For 100% loss-free images: the AxioCam HR. It provides high resolution imaging at low objective magnifications – and thus a large field of view with high resolution. An interesting alternative in terms of price: the AxioCam MR. With resolution, quality and sensitivity far surpassing that of video cameras, both of these cameras from Carl Zeiss guarantee sharp and brilliant images in color or B&W. AxioCam's simplicity of design removes the messy control boxes, multiple cables and hard-to-handle operation of other camera systems. Thanks to their compact design and optimal adaptation to microscope and software, these cameras are the "resolution solution" for the Axioskop 40 Pol.

*Magnetic domains in a garnet film, reflected light polarization.*

*Image: Dr. R. Schäfer, TU Dresden, Institut für Festkörper- und Werkstoffforschung.*







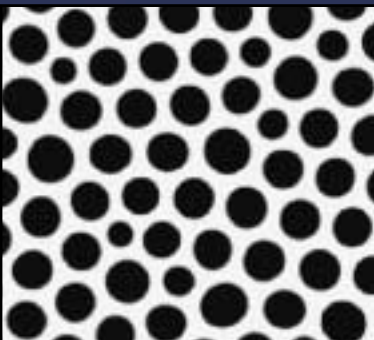
*Plastic, thin section,  
transmitted light  
polarization.*

## **AxioVision: Intelligence for materials image documentation**

AxioVision has set the standard in modern image processing, image analysis and archiving. Thanks to its modular structure, this innovative software solution from Carl Zeiss is equally suitable for basic digital imaging as well as for sophisticated high-end applications of materials microscopy. AxioVision provides a wealth of advantages. Free configuration of the menus guarantees more efficient and reproducible work. "Macros", another user-friendly feature, allows automatic storing of complete processes with a single key stroke. ZVI – the superior Carl Zeiss image format that links

image and imaging parameters simultaneously in a single file. The list continues: convenient archiving in a relational database, VBA interfaces for individual programming, modern Windows basis etc. AxioVision is based on an uncompromising philosophy of excellence: easy intuitive operation, extreme flexibility, the highest possible performance and an outstanding price-performance ratio.

*Compact, powerful and quickly adaptable via C-mount:  
the "Zeiss blue" is outstanding in research and routine  
applications.*



# The figures, the facts - Axioskop 40 Pol in detail

## Stands

Transmitted light:	6 position nosepiece Pol (5x H W 0.8; 1x HD DIC M27), 5 position reflector turret
Transmitted and reflected light:	6 position nosepiece Pol (5x H W 0.8; 1x HD DIC M27), 5 position reflector turret

## Contrasting techniques

Transmitted light:	Polarization contrast, orthoscopy, conoscopy, measuring techniques, brightfield, phase contrast, DIC, darkfield
Reflected light:	Polarization contrast, measuring methods, brightfield, darkfield, DIC, C-DIC, fluorescence

## Objectives

Transmitted light:	CP-Achromats Pol, Plan-Neofluars Pol
Reflected light:	Epiplans Pol, Epiplan-Neofluars Pol, EC Epiplan-Neofluars Pol
Special objectives:	LD Epiplan objectives (long working distance), immersion objectives

## Eyepieces

Eyepieces with 23 mm field of view, 10x magnification
---

## Special modules

Conoscopy:	Bertrand lens easily adaptable in reflector turret
Magnetic domains:	First conventionally usable technique for contrasting of Kerr effect

## Ergonomy/operating comfort

Stand:	Sturdy, space-saving design
Focus stop:	Protection of specimen and objective
Working area:	Large area; objective points away from the user for easy access to specimen
Reflector cube:	Push&Click for easy exchange
Ergotube/ photoergotube:	20° viewing angle, height-adjustable in 50 mm range

## Documentation

Tubes:	20° ergotube/photoergotube, 30° phototube, binocular tubes of research microscopes
Camera:	AxioCam HR and AxioCam MR
Adapters:	For many models of cameras
Software:	Camera software, AxioVision

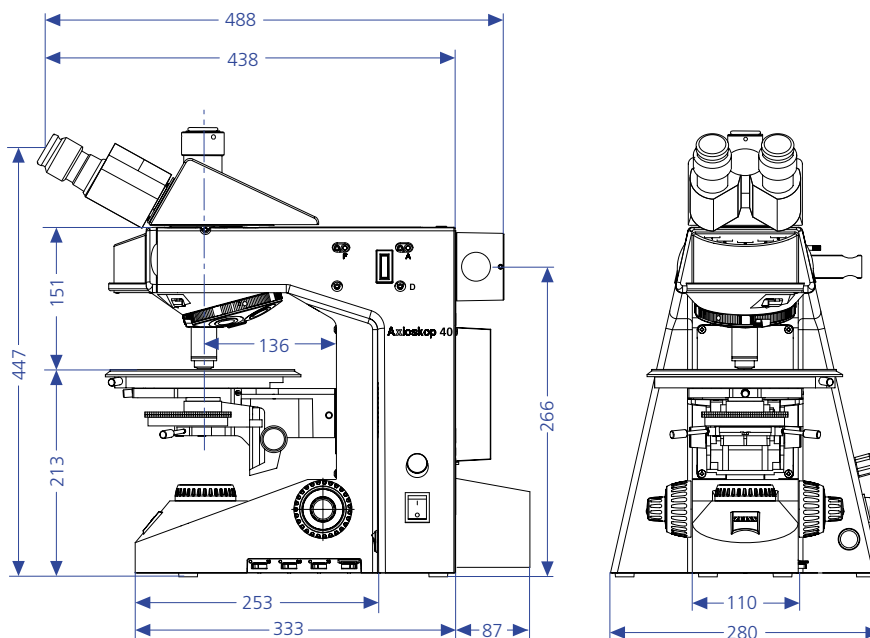
# The crucial plus in performance – Carl Zeiss sales and service support

**The decision you make for a microscope, one equipped with the components you need, is as complex as the requirements it must meet. A skilled team of consultants will help you with budget planning and technical needs.**

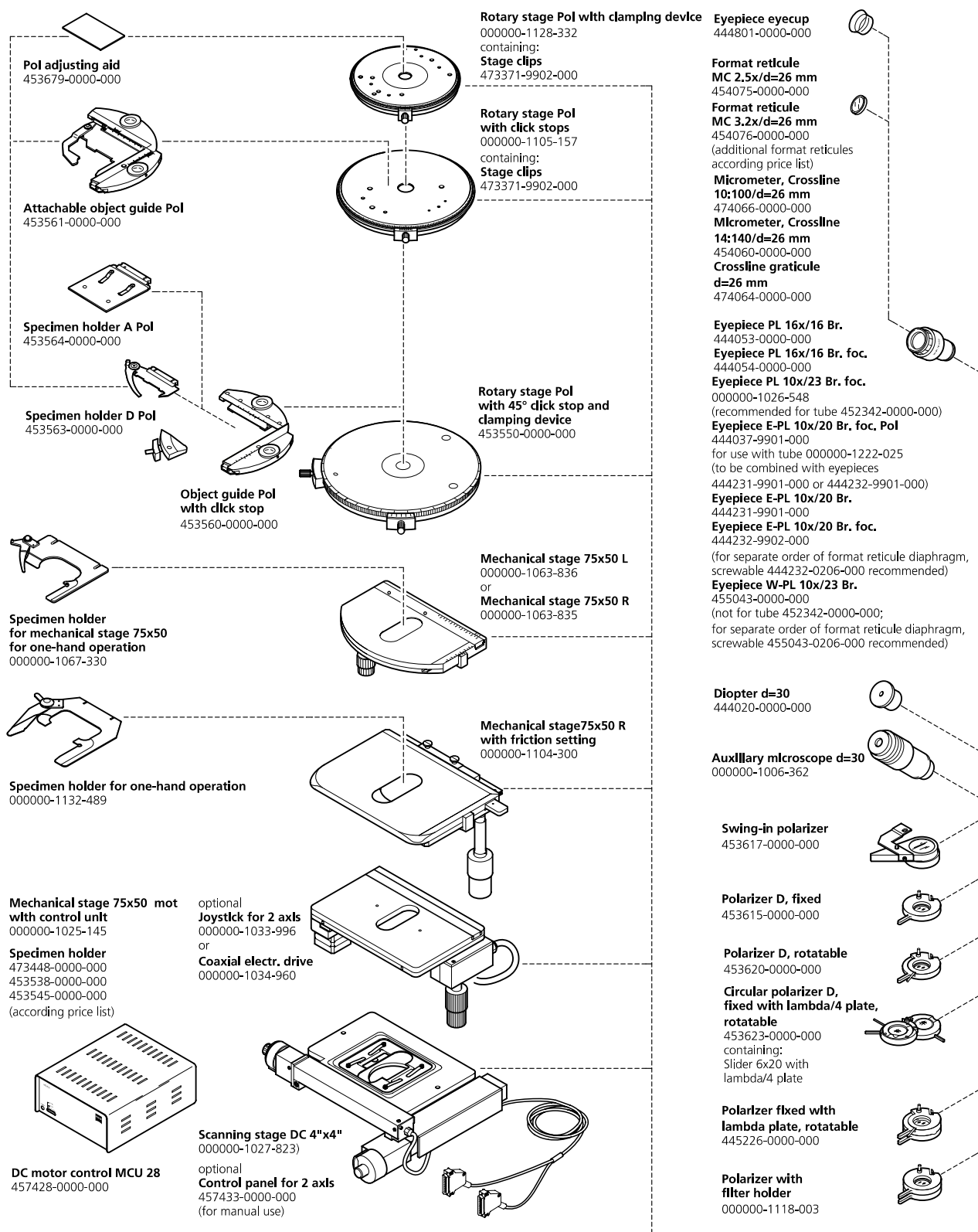
All Carl Zeiss consultants possess impressive know-how and experience as well as extensive knowledge of the entire microscope market. Thus you benefit from much more than our skill in developing microscopes. You will be able to draw upon the enormous wealth of experience that Carl Zeiss has accumulated in decades of practice in research and routine. You will profit from concrete assistance with your microscope needs – and above all from innovative techniques, which will enable you to make great progress in your work.

You can only appreciate the full range of Carl Zeiss service after you have made your purchase – in daily work. That's when it really counts.

Our local consultants and technicians are ready to support you with service and technical support, whenever you need it – fast and reliably. In addition, Carl Zeiss training courses and workshops provide you with added insights into the practical sides of microscopy, imaging and analysis. In fact, when you add together all the services and support that you get with Axioskop 40 Pol, you'll see that it is more than a high-power microscope: Axioskop 40 Pol is your ticket to a powerhouse of knowledge in microscopy that has been built up over the past 150 years.

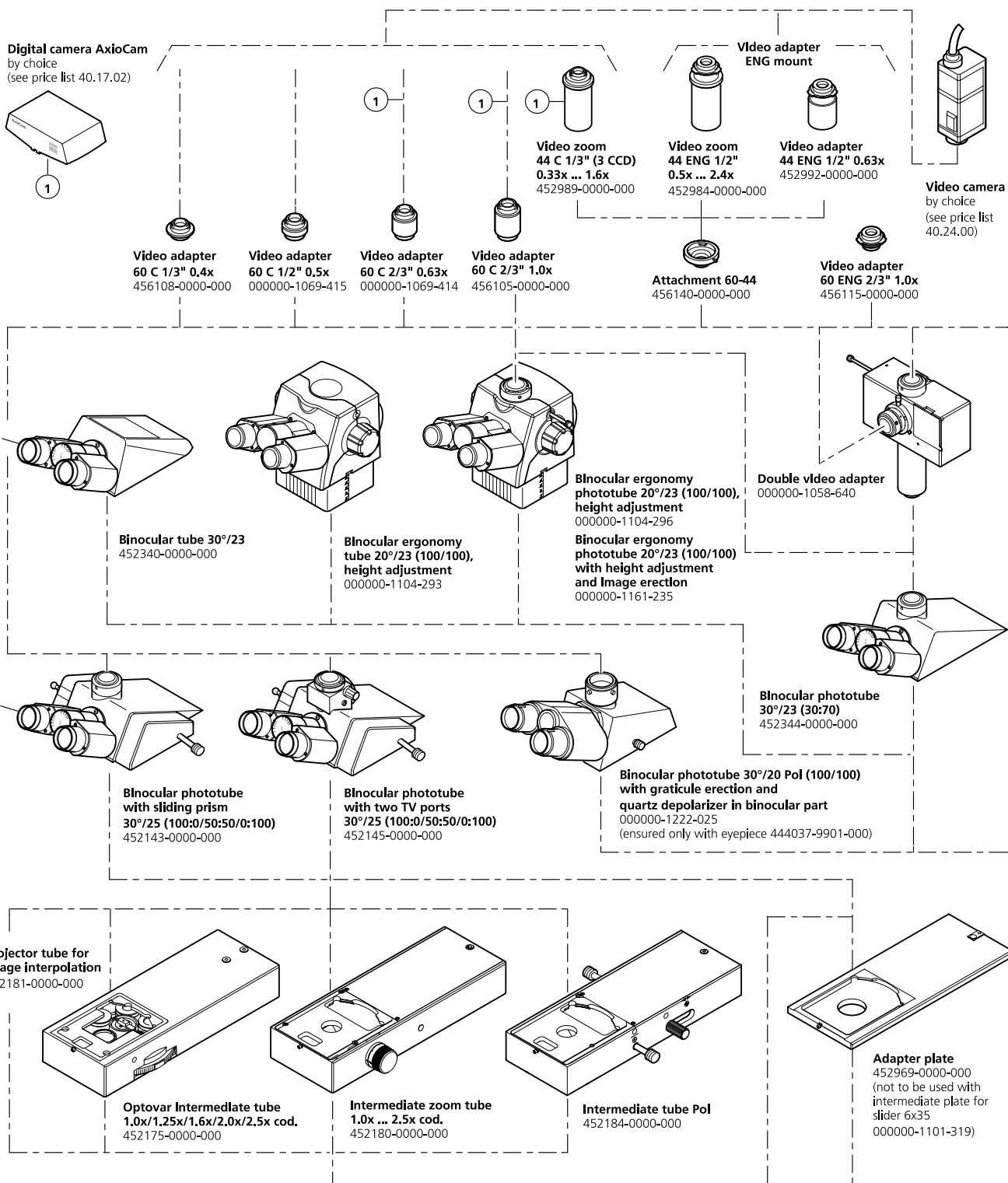


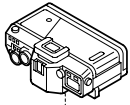
# Axioskop 40 Pol - System overview



For additional specimen holders, see Axioskop 40 System Overview.







**SLR camera housing**  
by choice  
(see price list 40.24.00)



**Compact digital camera**  
by choice  
(see price list 40.24.00)



**T2 adapter**  
by choice  
(see price list 40.24.02)

**Digital camera adapter  
D 40 M37/52x0.75**  
000000-1096-522



**Digital camera adapter  
44 M52x0.75**  
000000-1108-984



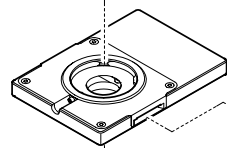
**Adapter for SLR camera  
2.5x for T2**  
456005-0000-000

**Adapter 60 for  
microscope camera,  
d=30 mm**  
456006-0000-000

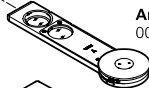


**Adapter 60-44**  
456140-0000-000

**Microscope camera MC 80**  
(see price list 40.24.00 for  
equipment and accessories)



**Intermediate plate for slider 6x35**  
000000-1101-319  
in addition provided  
**Tube lens**  
452149-0000-000



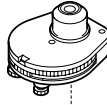
**Analyzer, rotatable**  
000000-1076-680



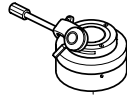
**Abbe-condenser 0.9/1.25**  
445302-0000-000



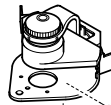
additional by choice:  
**Annular diaphragm Ph 1, insertable**  
445305-0000-000  
**Annular diaphragm Ph 2, Insertable**  
445306-0000-000



**Abbe condenser 0.9/1.25 with 5x turret disk**  
H, D (0.65/0.9) and Ph 1, Ph 2, Ph 3  
445303-0000-000



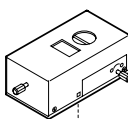
**Condenser 0.9 Z Pol with swing mechanism**  
445212-0000-000  
**Condenser adapter for Axiolab Pol**  
445462-0000-000



**Achromatic-aplanatic system condensor 0.24/dia. 10.7,  
swivel-type, Pol**  
445325-9901-000  
**Front optics 0.9/dia. 2.9 Pol**  
445331-0000-000



**Brightfield insert**  
445467-0000-000



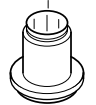
**Darkfield illuminator**  
445314-9901-000



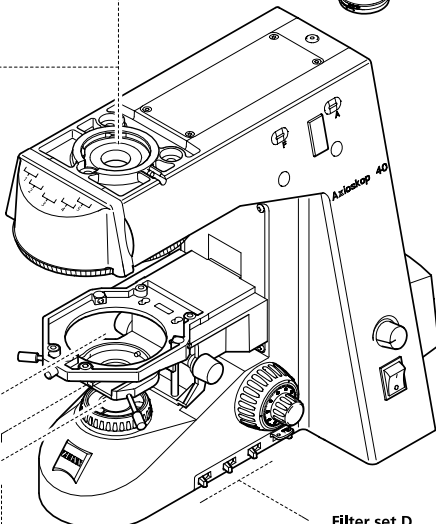
**Ultra condenser  
1.2/1.4 (0.75-1.0)**  
465500-0000-000



**Dry darkfield  
condenser  
0.8/0.95 (0.6-0.75)**  
465505-0000-000

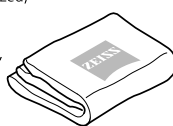


**Condenser holder Z  
for darkfield condenser**  
445323-0000-000

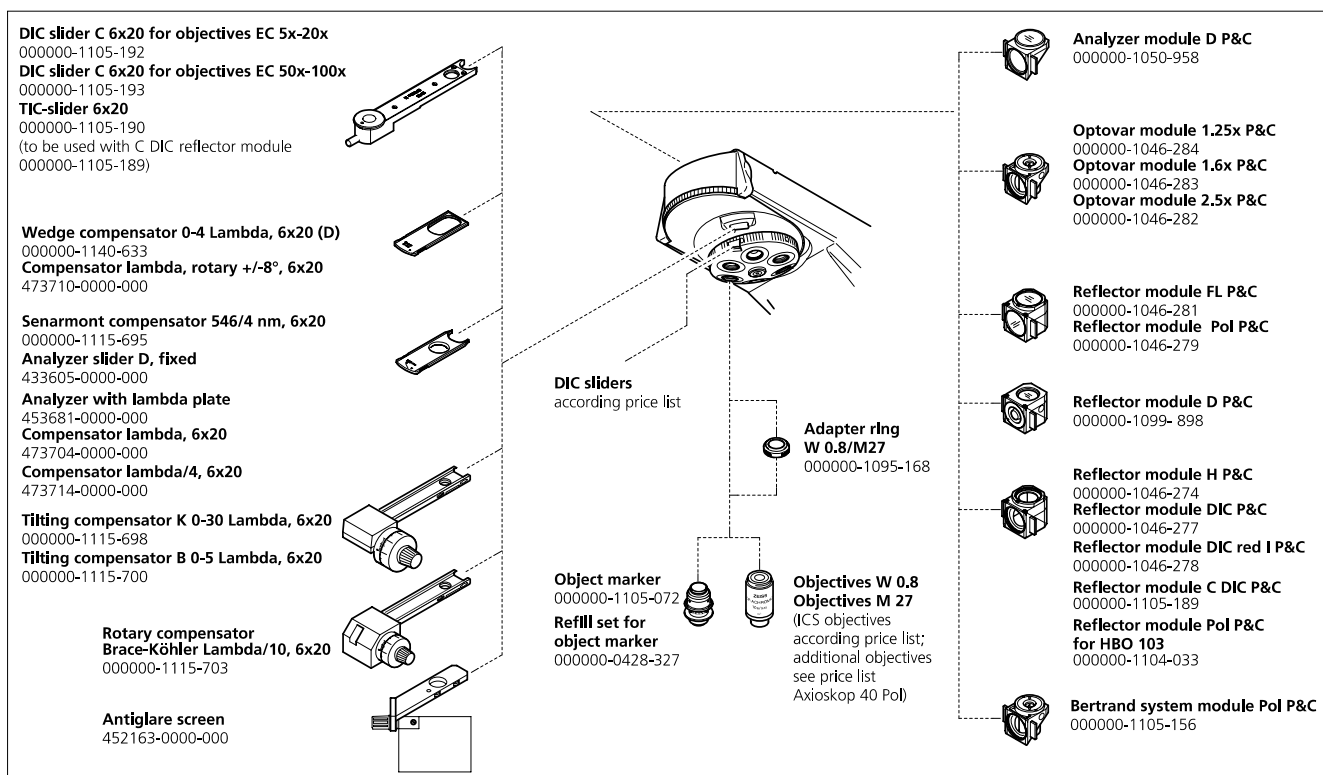


**Axiolab 40 Pol microscope stand**  
000000-1128-327

Including:  
Nosepiece Pol, 6-position  
(with 5x H W 0.8 and 1x H D DIC M27),  
Reflector turret, 5-position,  
Built-in 12 V 35 W power supply, stabilized,  
100 ... 240 V AC/50...60 Hz/100 VA,  
Transmitted-light illumination with  
integrated 12 V 35 W attachment lamp,  
Luminous-field diaphragm insert  
with iris diaphragm and  
switchable pinhole stop,  
Stage and condenser carrier



**Dust cover**  
459311-0000-000



**Quartz depolarizer**  
000000-1128-331

**Adjusting aid  
for HBO/XBO**  
452369-0000-000

**Filter slider A**  
452174-0000-000

**Axioskop 40 A Pol microscope stand**  
000000-1128-330

**Filter set D**  
000000-1058-230

including:  
Nosepiece Pol, 6-position  
(with 5x H W 0.8 and 1x H D DIC M27),  
Reflector turret, 5-position,  
Built-in 12 V DC 100 W power supply, stabilized,  
100 ... 240 V AC/50 ... 60 Hz/150 VA 2 ... 12 V DC  
with reflected-light / transmitted-light selector switch,  
Transmitted-light illumination with  
integrated 12 V 35 W attachment lamp,  
Luminous-field diaphragm insert  
with iris diaphragm and switchable pinhole stop,  
Stage and condenser carrier lockable and vertically adjustable

**Dust cover**  
459311-0000-000

**100 HAL lamp housing  
with collector, lamp mount**  
447219-0000-000

**Transformer HBO 103 ebq 100 dc**  
000000-1003-928 or  
**FluoArc variable intensity lamp  
control for N HBO 103**  
000000-0434-355

**Achromatic collector**  
000000-1007-978 or  
**Collector N HBO 103/XBO 75**  
000000-1007-976 or  
**Quartz collector N HBO 103/XBO 75**  
000000-1007-977  
**Mercury vapor short-arc lamp HBO 103 W/2**  
380301-9350-000

**Lamp housing  
N HBO 103**  
000000-1007-980

**Transformer mbq 52 ac-z  
for HBO 50ac**  
000000-1113-833

**Lamp housing HBO 50 with socket**  
447220-0000-000  
**Lamp collector HBO 50/SF 25**  
447270-0000-000  
**Mercury vapor short-arc lamp HBO 50**  
381619-0000-000

**For N XBO 75 illuminator**  
see price list 40.23.00 (microscope lamps and filters)

# Axioskop 40 Pol - added performance at a glance

<b>Practice-driven</b>	Powerful polarization and materials microscope
<b>Cost-effective</b>	Transmitted light or combined transmitted/reflected light microscope
<b>Modern</b>	Integrated digital imaging system
<b>Unique in its category</b>	6 position centering nosepiece and 5 position reflector turret for all established contrasting techniques
<b>Superior</b>	Time-tested Carl Zeiss optics in all ranges of objectives
<b>Powerful</b>	With all required contrasting and measuring techniques
<b>Innovative</b>	With TIC, C-DIC and special module for magnetic domains
<b>Tailor-made</b>	Modular construction
<b>Good investment</b>	Easily retrofittable, e.g. with conoscopy or fluorescence modules
<b>Operator-friendly</b>	Through sophisticated details and outstanding ergonomomy
<b>Robust</b>	Through best-quality construction and sturdy pyramid design

## Carl Zeiss Light Microscopy

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Subject to change