

Universal R Pol
Photomicroscope III Pol
polarizing microscopes

ZEISS

Carl Zeiss
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New polarizing microscopes
for science and technology



New polarizing microscopes with the following major advantages

New binocular tube G Pol

Adjustment of the tube to the user's interpupillary distance does not affect tube length and focusing. A special mechanism automatically maintains the orientation of the eyepiece crosslines. For photomicrography the alignment of viewing plane and camera image plane is always the same and need not be checked.

New intermediate tube with Bertrand optics

The focusable and centerable Bertrand optics are coupled with a diaphragm, and allow **binocular** observation and photography of the conoscopic image.

Functional design

Stage carrier and condenser carrier can be dismantled separately, and vertically adjusted independent of the focusing control so that specimens of several centimeter thickness can be examined. Any one of the full line of interchangeable stages for polarizing microscopy can be attached to the stage carrier.

Universal R Pol and Photomicroscope III Pol polarizing microscopes for reflected and transmitted light, all contrast-enhancing illuminating and imaging techniques, and for quantitative image analysis.

Contrast-enhancing methods

(The figures in brackets refer to relevant literature)

Darkfield illumination

Fluorescence excitation (41-350)

Phase contrast (41-211)

Differential interference contrast (DIC) (41-215)

The use of Antiflex optics (A 41-656.1)

Jamin-Lebedeff double-beam interference (41-540)

Multi-beam interference (A 41-652.1)

Supplements

Attachment cameras MC 63, MC 63 A, MC 63 C (41-401)

Computer-controlled spectrophotometry and plotting of spectral curves (41-820)

The polarizing microscope as a tool for investigation, measurement and identification

Mineralogy and geology

Rock and ore-forming minerals, macerals, rock, mineral or ore deposits, structures and textures.

Crystallography

Composition and structure of crystals, natural and synthetic solid matter.

Metallography

Optically anisotropic metal alloys and inclusions, composition, structure and texture.

Chemistry

Morphology and optical properties of crystals and glasses. Organic solid matter, polymeric fibers and foils. Precipitation tests.

Criminology

Hair, natural and synthetic fibers, toxic agents.

Biology and medicine

Optically anisotropic constituents of living and dead organisms, such as parts of skeletons, teeth, crystalline inclusions, siliceous particles, calculi, animal muscular and plant fibers. Deductions can be made to possible submicroscopical structures in biological and medical specimens.

Technology

Building material (concrete), ceramics, fireproof ceramics, rock and soil, air and water pollutants (dust, suspension).

Universal R Pol microscope

Large, expandable, binocular research microscope for transmitted and reflected-light work and quantitative image analysis (microscope photometry, TV image analysis).

The tube head features two ports. The port in front accepts the binocular tube, the one on top serves for the attachments for projection, photometry, photomicrography and cinemicrography.

A mirror in the beam path directs the light to the front for observation. If it is swung out of the beam path all the light is relayed to equipment mounted on top of the tube head.

Illumination system

In-base illuminator with 6 V 15 W low-voltage filament lamp for most transmitted light work. This illuminator can be replaced by an attachable higher-intensity system e.g. Illuminator 100 with 100 W halogen lamp or high-pressure gas discharge sources. All illuminators are compatible with Microflash II.

From a second illumination tube in the stand light for reflected-light work is directed to the vertical illuminator without deflection. The Illuminator 100, can also be used in this mode. Two illuminators can be used on the microscope, both simultaneously for transmitted and reflected light. For more information see catalog 41-140.

Universal R Pol microscope with Illuminator 100 (transmitted light), Attachment Camera MC 63 with 35 mm camera housing M 35, and control unit for automatic exposure.



Photomicroscope III Pol

Large, expandable, binocular camera microscope for transmitted and reflected-light work and quantitative image analysis (microscope photometry, TV image analysis), with integral 35 mm camera and automatic exposure control.

Power supply unit for electrical supply of electronics and automatic exposure control, and for up to 100 W illuminators (filament or halogen lamps).

Illuminators

In-base illuminator with 6 V 15 W lamp, which can be replaced by attachable illuminators with higher-intensity lamps such as the Illuminator 100. Built-in switchover from transmitted to reflected light using the same illuminator. All illuminators are compatible with Microflash II.

Filter selection pushbuttons on the microscope base for transmitted-light work, to operate six light filters which can be brought into the beam path singly or combined.

Integrated 35 mm camera

Cassette with motorized film transport, beam splitter which relays small part of the light to a photomultiplier for exposure control.

The specimen remains visible in the viewing tube during photography.

Control buttons right on the instrument base offer the choice of automatic or manual control of the exposure time.

The automatic exposure control is adjustable to the film speed in the range from 5 to 40 DIN (2.5–8000 ASA). Manual selection of the exposure time is possible.

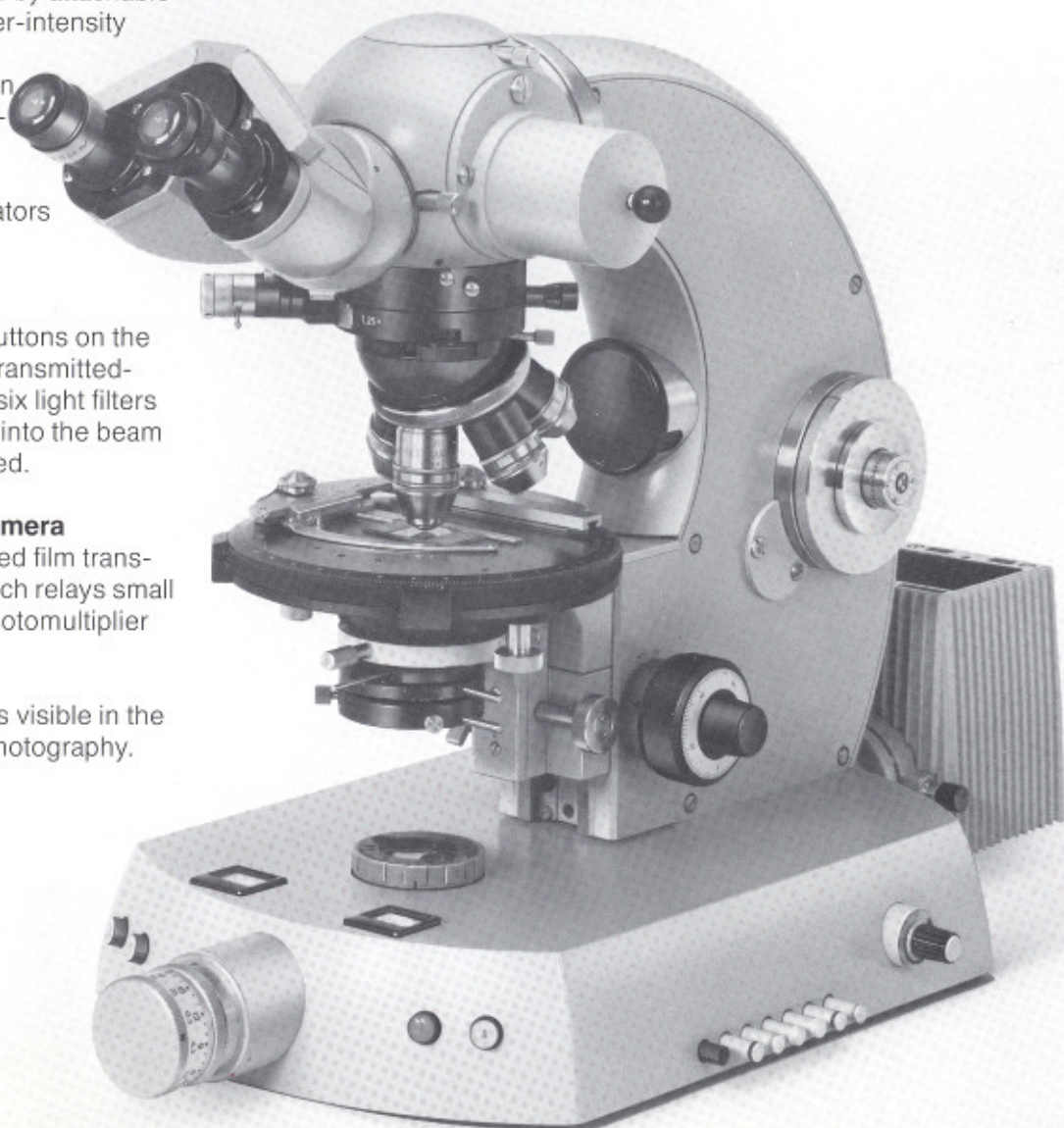
In-base

exposure time display and film speed selector which is marked for DIN and ASA.

Pushbutton **A** for automatic exposure, ready signal **!**, pushbutton **T** opens the shutter and closes it when pushed again, pushbutton **B** for photography with computer flash or selectable exposure times.

Photomicroscope III Pol with Illuminator 100 for transmitted light, can be switched to reflected light.

For more information see catalog 41-173.



Applications

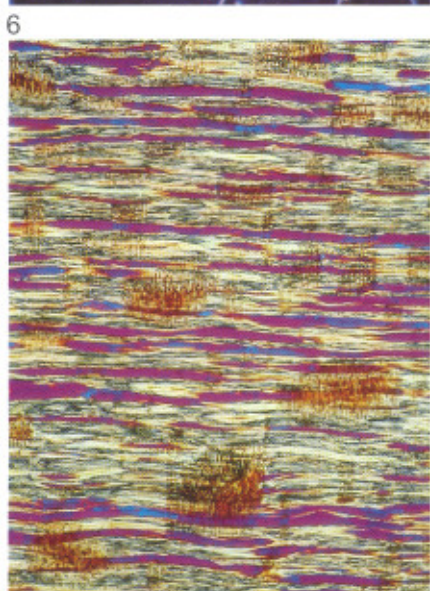
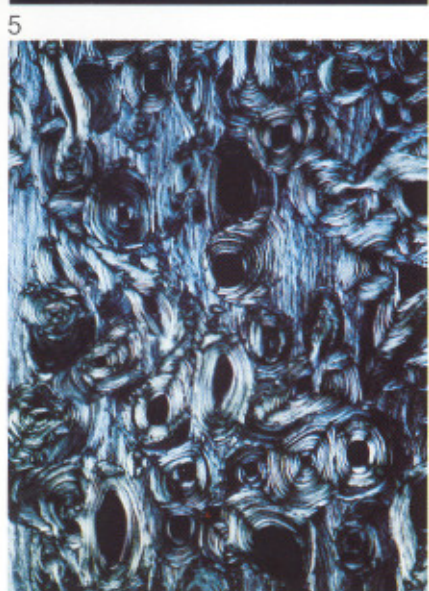


Fig. 1: Reflected-light polarization
Aluminium-molybdenum alloy
with crossed polarizer and analyzer
Magnification 40x
Photomicrograph courtesy M. Kage,
Weißenstein

Fig. 2: Transmitted-light polarization
Syllimarin (biocatalyst)
with crossed polarizer and analyzer
Magnification 125x
Photomicrograph courtesy M. Kage,
Weißenstein

Fig. 3: Transmitted-light polarization
Cross section of a pine needle
Universal Pol microscope
with crossed polarizer and analyzer
Attachment Camera MC 63
Planachromat 2.5/0.08
Magnification 12x
Photomicrograph by W. Cebulla,
Carl Zeiss, Oberkochen

Fig. 4: Reflected-light polarization
Ore microscopy
Polished ore section of lunar basalt
Sample collected by Apollo 17 crew
Center: armalcolite ($\text{Fe, Mg Ti}_2\text{O}_5$)
with traces of Al, Cr, Mn, V and Zr
surrounded by brighter ilmenite (FeTiO_3)
with crossed polarizer and analyzer
Magnification 340x
Photomicrograph by H. Piller,
Carl Zeiss, Oberkochen and
A. El Goresy, Institut für Kernforschung
der Max-Planck-Gesellschaft, Heidelberg

Fig. 5: Transmitted-light polarization
Human long bone, polished cross section
with crossed polarizer and analyzer
Magnification 250x
Photomicrograph courtesy M. Kage
Weißenstein

Fig. 6: Transmitted-light polarization
Muscle tissue from the taste bud
of the rabbit
Universal Pol microscope with
crossed polarizer and analyzer
Attachment Camera MC 63
Neofluar 25/0.6 Pol
Magnification 130x
Photomicrograph by W. Cebulla,
Carl Zeiss, Oberkochen

Front page
Conoscopic image and simultaneously visible
orthoscopic surrounding field.
Interference figure of a hornblende crystal in
amphiboleclogite.
Achromat 40/0.85 Pol.
Magnification of visible orthoscopic
surrounding field approx. 1250x
Specimen courtesy Prof. Dr. S. Koritnig,
Mineralogisch-petrologisches Institut der
Universität Göttingen.
Photomicrograph by W. Cebulla, Carl Zeiss
Oberkochen.

Basic optical equipment

For transmitted-light work	Cat. No.	For reflected-light work	Cat. No.
Strain-free Pol objectives			
Low-power planachromats, medium-power achromats and Neofluar objectives, high-power achromats and Plan-Neofluar objectives with high numerical apertures for orthoscopic and conoscopic investigations, in centering mount Z		Low, medium, and high-power achromatic objectives type Epiplan	
Planachromat 2.5/0.08 Pol Z	4601 18	Epiplan 4/0.10 Pol	462001
Achromat 10/0.22 Pol Z	460408	Epiplan 8/0.20 Pol	462002
Neofluar 25/0.60 Pol Z	460628	Epiplan 16/0.35 Pol	462003
Achromat 40/0.85 Pol Z	460708	Epiplan 40/0.85 Pol	462004
Plan-Neofluar 63/0.90 Pol Z	4608 18	Epiplan 80/0.95 Pol	462080
Achromat 100/1.25 oil Pol Z	461908	Epiplan 100/1.25 oil Pol	462005-9903
For lowest-power magnifications: Planachromat 1.25/0.08	462014	1 centerable change ring ea.	466256
Quintuple nosepiece	473157		
Strain-free Pol condensers		Vertical illuminators	
Condenser 0.9 with swing-out front lens Z Pol	465262	Condenser II C, reflectors H-Pl-Pol, H-Pr-Pol, securing ring for light filters, blue clear glass, neutral density filter NG 9, aperture diaphragm insert, rotatable polarizer, complete for Universal R microscope 486299 486368	
Condenser 1.3 with swing-out front lens Z Pol	465263		
Polarizer for transmitted-light condensers rotatable through 90°			
Slider with analyzer rotatable through 360°			473642
Auxiliary objects			
λ -plate	473704		
$\lambda/4$ -plate	473714		
Quartz wedge 1-3 λ	473724		
Eyepieces, crosshair eyepieces with guide pin			
Kpl crosshair eyepiece 8x/18 Pol			463925
Kpl eyepiece 8x/18 foc. (with focusing eyelens)			463923-9901
Kpl high-eyepoint, wide angle eyepiece 12.5x/18 Pol with crossline micrometer			464145
Kpl high-eyepoint, wide angle eyepiece 12.5x/18 foc. (with focusing eyelens)			464143
Diopter for conoscopic observations without Bertrand optics			464889
Accessories			
Other condensers, auxiliary objects, rotary λ -plate and quartz compensators, Brace-Köhler and Sénarmont compensators and Ehringhaus rotary compensators, see pricelist 6 (Universal R Pol microscope) and pricelist 7 (Photomicroscope III Pol)			

We reserve the right to change design or extent of instrumentation in the course of advanced development.