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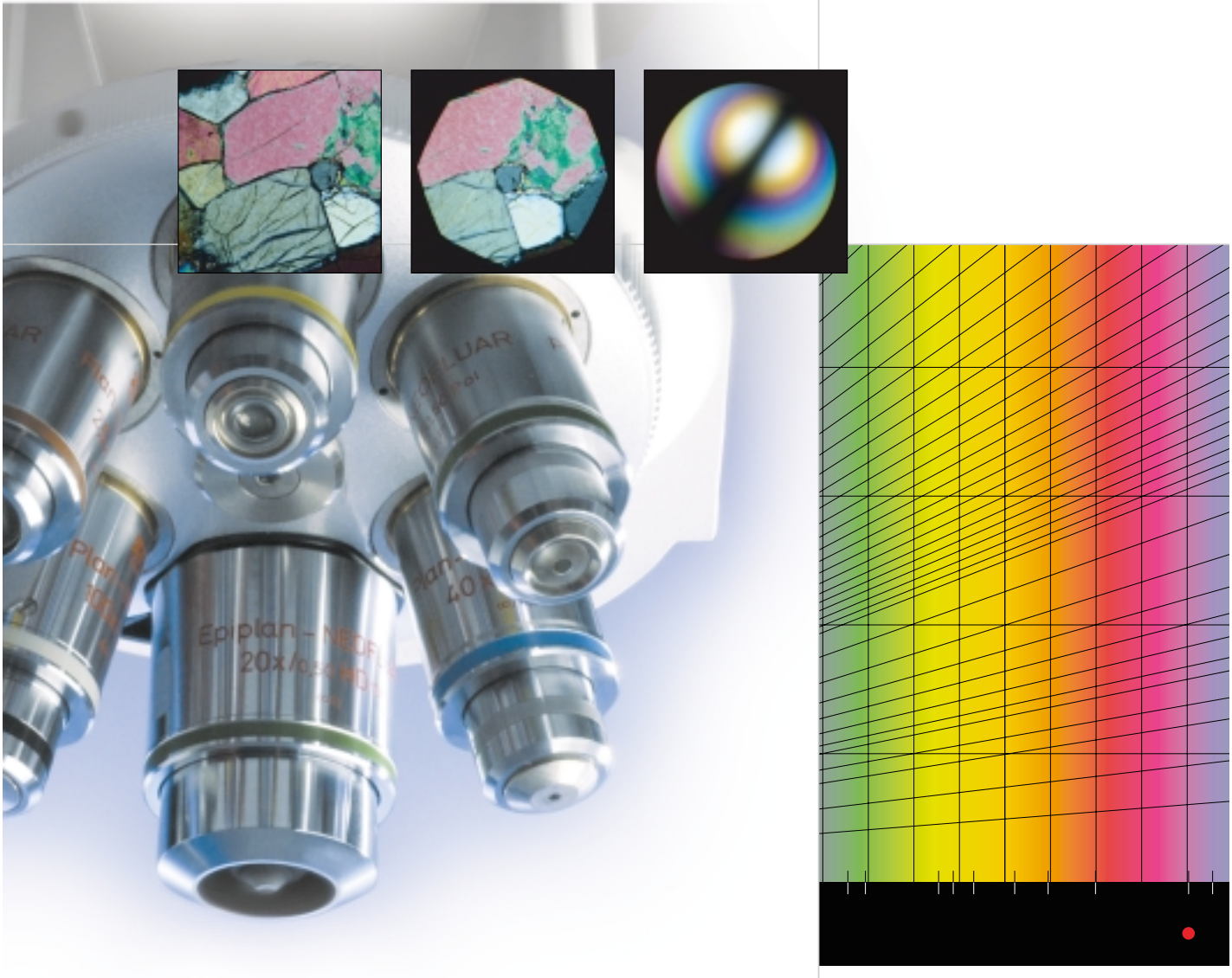
Microscopy from Carl Zeiss

Info-forum

Michel Lévy Color Chart
Polarized Light
Conoscopic Determination



Information forum:

Polarization microscopy

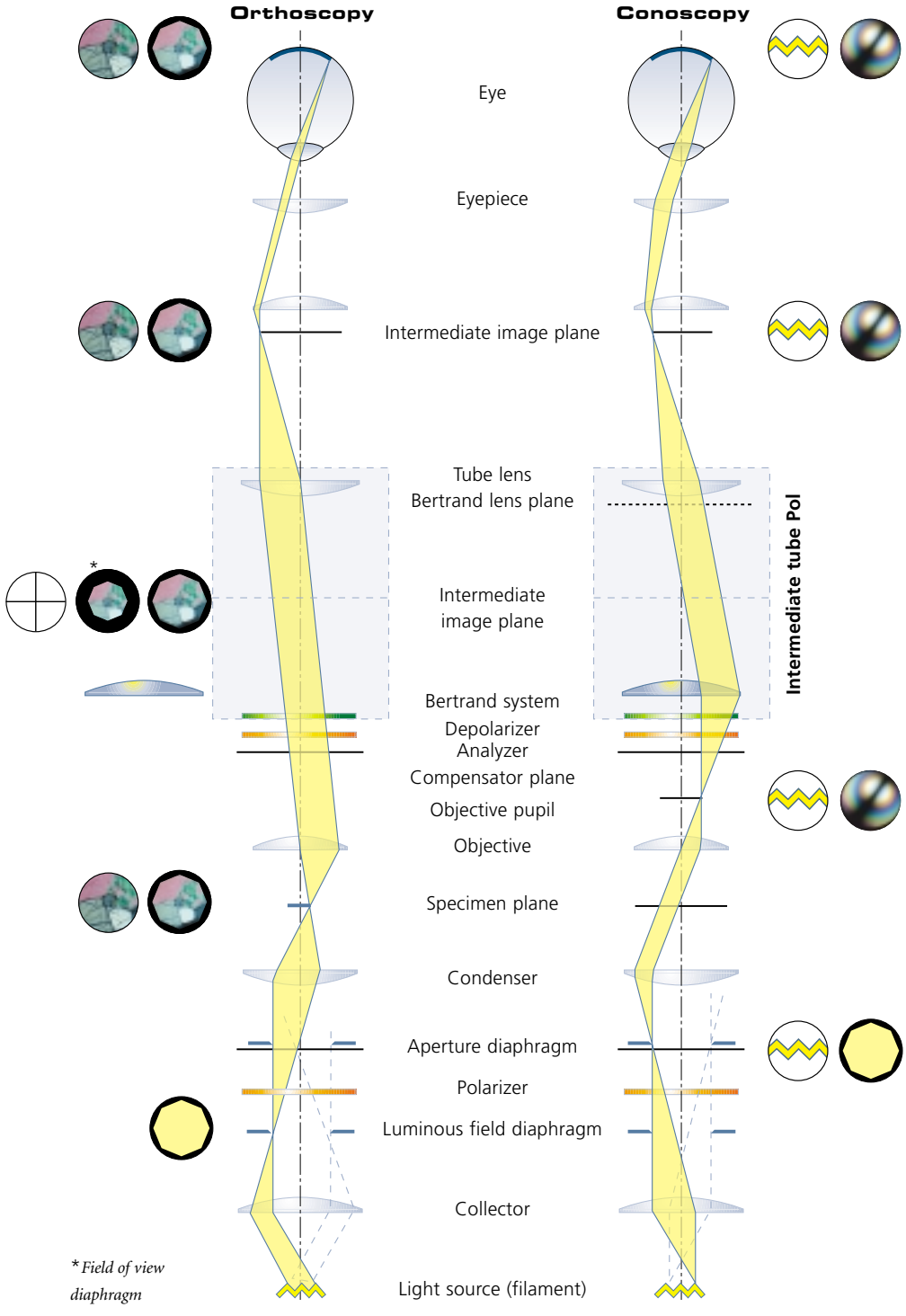
ZEISS

Polarization in transmitted light

Orthoscopy and conoscopy are the most important techniques in classical transmitted light polarization microscopy. With their different ways of examining, they provide different options, e.g. in mineral diagnosis in geological microscopy. In orthoscopy, each pixel corresponds to a dot in the specimen. Analyzing minerals is based on such morphological and optical features as form, cracks, color, pleochroisms, and their characteristic interference colors.

In conoscopy, each pixel corresponds to a direction in the specimen. This technique requires the use of the highest objective and condenser aperture possible. Particularly suitable objectives are CP-Achromat 50x/0.80 Pol, Plan-Neofluar 40x/0.85 Pol or Plan-Neofluar 100x/1.30 Oil Pol. When the Betrand lens is placed in the light path, the interference or axial image in the back focal plane of the specimen becomes visible. Conoscopy is used when additional information about the specimen is necessary for analysis. It provides interference images that can be seen through the eyepiece and enable differentiation according to 1 or 2 axes and with compensator λ (λ-lamina, Red I), according to 1-axis positive/negative or 2-axis positive/negative.

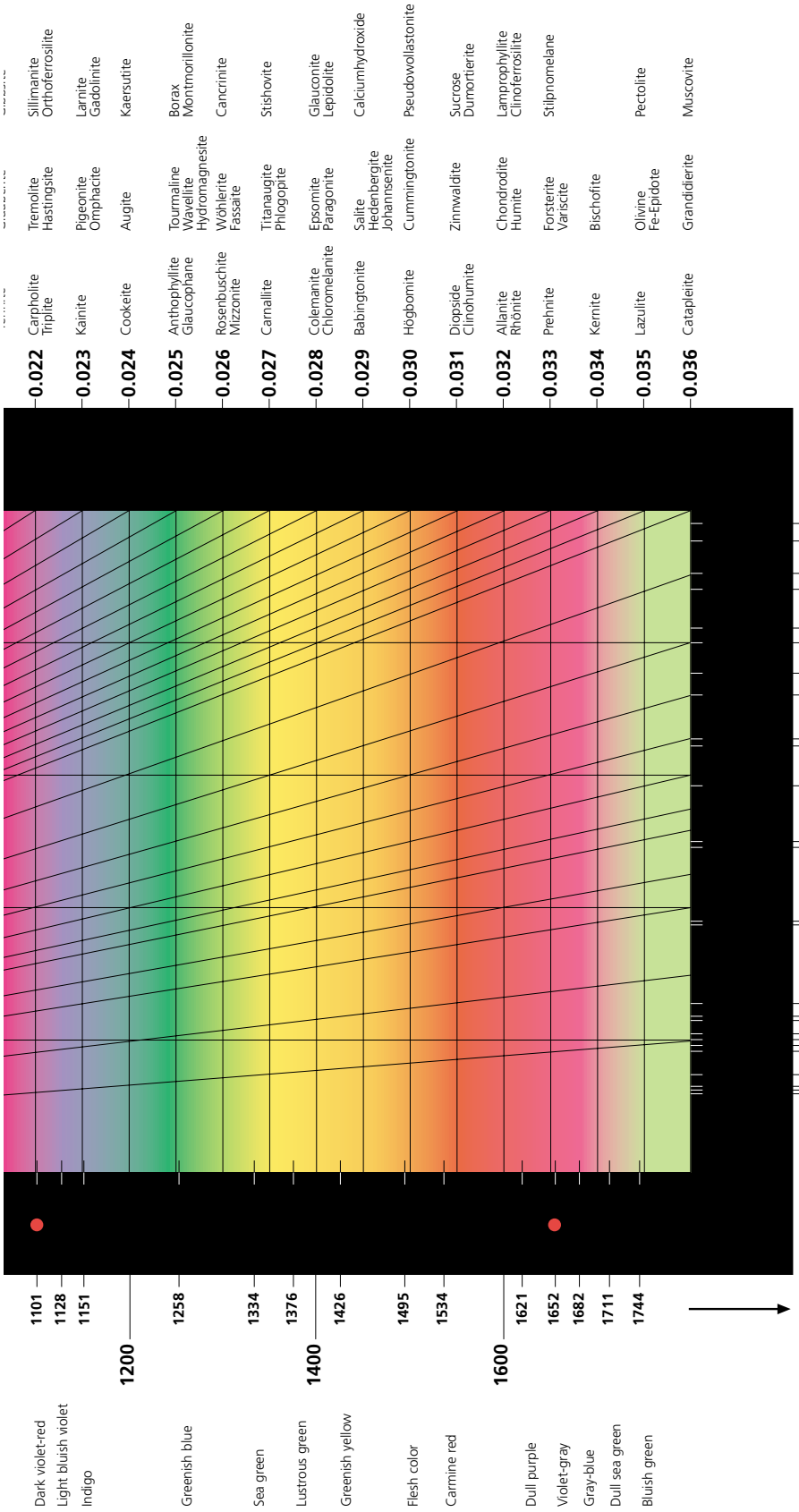
The intermediate tube Pol is designed for high-performance conoscopy. Thanks to its two additional intermediate image planes with suspended crosshair and field of view diaphragm, it permits the conoscopy of crystals larger than 10 µm.



** Field of view diaphragm*

Birefringence
($n_\gamma - n_\alpha$)
d [µm]
Thickness
0
10
20
30
40
50
0.001 Pennine Analcite Leucite Cryolite Melilite
0.002 Ripidolite Apophyllite Marialite Saponite Halloysite
0.003 Phillipsite Kämmererite Apatite Chabazite β-Cristobalite α-Tricalciumphosphate
0.004 Riebeckite Chamosite Eudialyte Vanthoffite Vesuvianite Tridymite
0.005 Clinozoisite Arfvedsonite Nepheline Sanidine Serendibite Coesite
0.006 Heulandite Sapphirine Glaserite Beryl Zoisite Harmotome Orthoklase Microcline Akermanite
0.007 Aenigmatite Antigorite Kaolinite
0.008 Chrysotile Triphylite Corundum Plagioclase An 20-60 Silicocarnotite Anorthoclase
0.009 Topaz Enstatite Cordierite Albite Celestite Struvite Quartz Rankinite Tricalciumsilicate
0.010 Axinite Epistilbite Mg-Riebeckite Stilbite Bronzite Chrysoberyl Gypsum Boracite
0.011 Clinochlore Chloritoid Andalusite Bytownite Gehlenite Scolecite
0.012 Laumontite Hydronephelite Clintonite Natrolite Barite Kornerupine γ-Dicalciumsilicate Brushite Petalite
0.013 Dipyre Staurolite Hypersthene Thenardite Margarite Anorthite Rhodonite Trona Wollastonite
0.014 Eckermannite Thuringite
0.015 Epidote Picromerite Jadeite Crossite Bustamite Boehmite
0.016 Phenakite Merwinite Monticellite Richterite β-Dicalciumsilicate Mullite
0.017 Syngenite Kyanite Na-Tremolite Gedrite
0.018 Hiortdahlite Thomsonite
0.019 Lawsonite Pumpellyite Pargasite Polyhalite Amesite
0.020 Melinophan Actinolite Alunite Vermiculite Katophorite Spodumene Amblygonite
0.021 Barkevikite Prehnite Comm. Hornbl. Glauberite Brucite Gibbsite
0 Black
40 Iron gray
97 Lavender gray
158 Gray blue
200
218 Clear gray
234 Greenish white
259 Nearly pure white
267 Yellowish white
275 Pale straw yellow
281 Straw yellow
306 Light yellow
332 Bright yellow
400
430 Brown-yellow
505 Red-orange
536 Red
551 Deep red
565 Purple
575 Violet
589 Indigo
600
664 Sky blue
728 Greenish blue
747 Green
800
826 Lighter green
843 Yellowish green
866 Greenish yellow
910 Pure yellow
948 Orange
1000 — 998 Bright orange-red
First Order
Second Order

Michel Lévy Color Chart

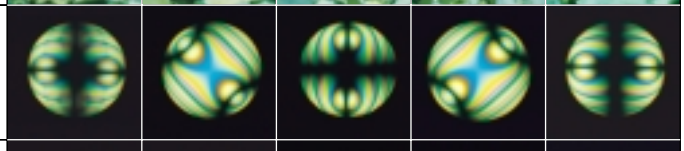
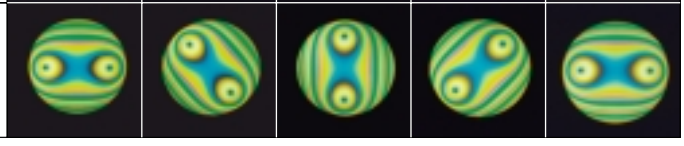


-0.040	Tephroite	Tilleyite	Låvenite	0,038
	Meionite	Spurrite	Nontronite	0,039
	Aegerine-augite	Biotite	Phengite	0,041
-0.045	Grunerite		Titanbiotite	0,043
	Datolite		Anhydrite	0,044
		Carborundum		0,045
	Talc		Pyrophyllite	0,047
-0.050	Monazite	Diaspore	Fayalite	0,048
	Zircon		Ilvaite	0,049
	Aegirine	Cholesterole		0,050
-0.055	Astrophyllite			0,052
-0.060		Silk	Piemontite	0,055
		Nylon		0,060
-0.065	Basaltic Hornblende		Kieserite	0,063
-0.070	Oxyhornblende			
		Cellulose		0,065
	Ascharite			0,070
-0.080	Anatase	Maltose		0,073
-0.090	Siderophyllite		Stilpno melane	0,080
		Bicalciumferrite		
		Brownmillerite		0,090
		Glucose	Cassiterite	0,096
-0.120	Baddeleyite		Xenotime	0,107
	Sphene	Carbamide		0,120
	Brookite		Goethite	0,140
-0.180	Columbite	Monocalciumferrite		0,150
	Aragonite		Whewellite	0,156
	Calcite		Ludwigite	0,172
	Dolomite			0,180
	Magnesite			0,195
	Siderite			0,241
	Pyrophanite			0,270
	Hematite			0,280
	Rutile			0,286
	Geikielite			0,36
	Lepidocrocite			0,57

Third Order

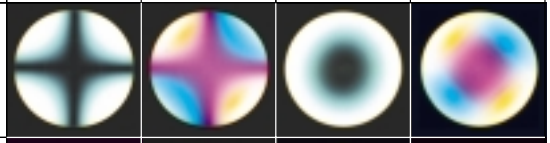
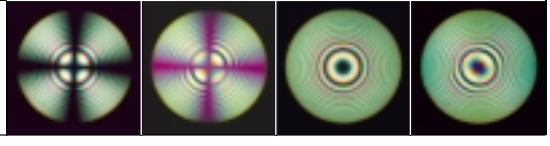
We make it visible.

Linear and circular polarized light

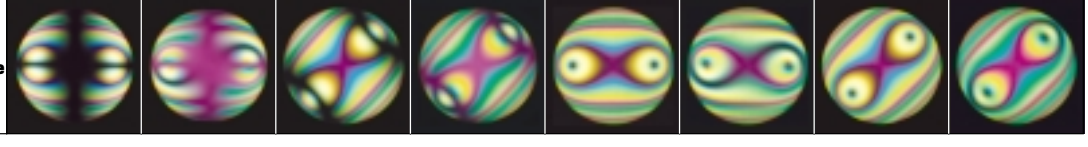
State of polarization of the light			Rotation of the microscope stage				
			0°	45°	90°	135°	180°
Specimen	Zircon	linear					
		circular					
	Muscovite	linear					
		circular					

Behavior of optically anisotropic crystals in linearly and circularly polarized light in orthoscopic and conoscopic observation.

Determination of optical character

uniaxial	State of polarization of the light			
	linear		circular	
	compensator λ			
	without	with	without	with
positive quartz				
negative calcite				

Determination of the optical character of uniaxial and biaxial minerals in linearly and circularly polarized light. The reference direction n_y of the λ-compensators is oriented NE-SW.

biaxial	State of polarization of the light							
	linear				circular			
	compensator λ							
	without	with	without	with	without	with	without	with
	normal position		diagonal position		normal position		diagonal position	
positive barite								
negative muskovite								

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Dunite thin section, transmitted light polarization

Polarization microscopy from Carl Zeiss

Polarization microscopy from Carl Zeiss is based on Axioskop 40 Pol and Axioplan 2 imaging Pol. Two powerful microscopes that are tailor-made for your individual applications and designed to meet the growing needs of polarization microscopy – easier and more effectively than ever before.

	Stands	Tubes	Reflector turrets	Nosepieces	Polarizers	Analyzers	Bertrand system
Axioskop 40 A Pol	Transmitted light (basic version)	Binocular tube 30°/23 or binocular tube with photo-port 20°/20 Pol or ergotube 20°/23 and other tubes if desired		6 position H	All polarizers except Circular Polarizer D	Analyzer slider or analyzer slider with λ-plate	Diopter or auxiliary microscope
Axioskop 40 Pol	Transmitted light		5 position, change of Push&Click mod-ule without tools	6 position Pol (5xW 0.8 screw thread, 1xM27 screw thread for HD DIC objective), individu-ally centerable	**Transmitted light:** Polarizer (switch-able), polarizer (rotatable with 0° and 90° stop), polarizer (switch-able with λ-plate, rotatable) **Reflected light:** Reflector module Pol, reflector mod-ule Pol for HBO 103	Analyzer module or measurement ana-lyzer with 0.1° splitting, 180° rotatable	Fixed focus Betrand module and switchable pin hole diaphragm or inter-mediate tube Pol with centerable Betrand lens; crosshair and field of view diaphragm in additional inter-mediate image planes
	Transmitted and reflected light						
Axioplan 2 imaging Pol	Transmitted light	Binocular tube with photo port 30°/25 with slider prism or with 2 ports, TV tube mio. with 2 ports and further tubes from the Axioskop 2 pro-gram if desired	8 position, manual or motorized, change of Push&Click module without tools	6 position Pol, encoded (5xW 0.8 screw thread, 1xM27 screw thread for HD DIC objective), individu-ally centerable	**Transmitted light:** Polarizer (switch-able), polarizer (rotatable with 0° and 90° stop), polarizer (switch-able with λ-plate, rotatable) **Reflected light:** Reflector module Pol, reflector module Pol for HBO 103	Analyzer module or analyzer slider or analyzer slider with analyzer and λ-plate, rotatable +/- 10° or measure-ment analyzer with 0.1° splitting, 360° rotatable	Intermediate tube Pol with centerable Betrand lens; crosshair and field of view diaphragm in additional inter-mediate image planes
	Transmitted and reflected light						
	Reflected light						

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Subject to change

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