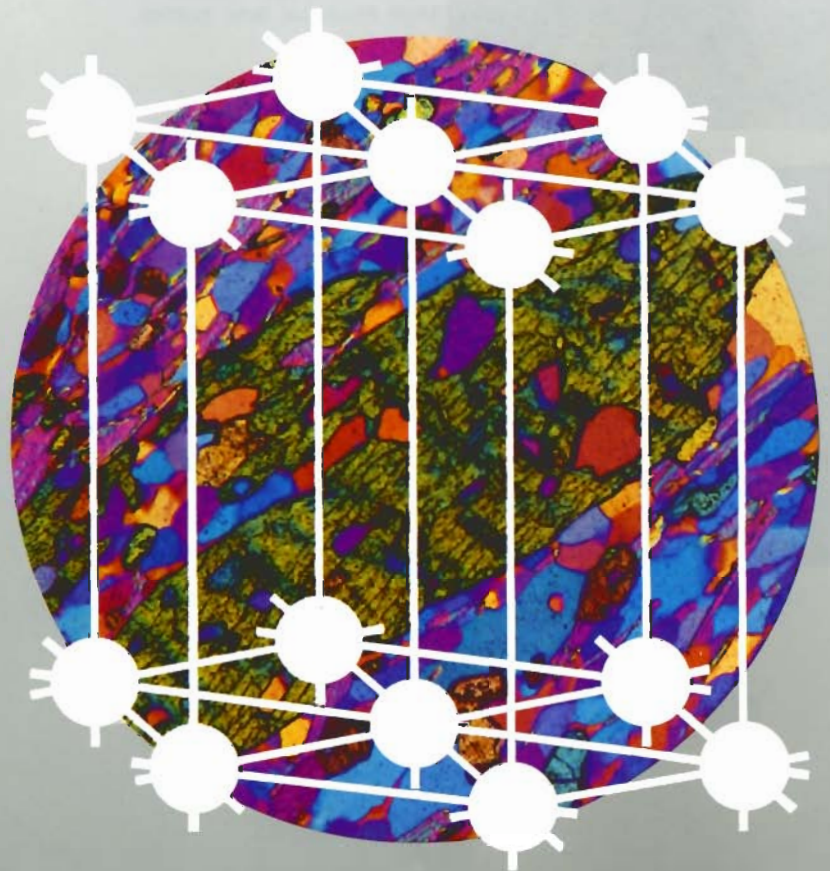


LEITZ ORTHOPLAN-POL

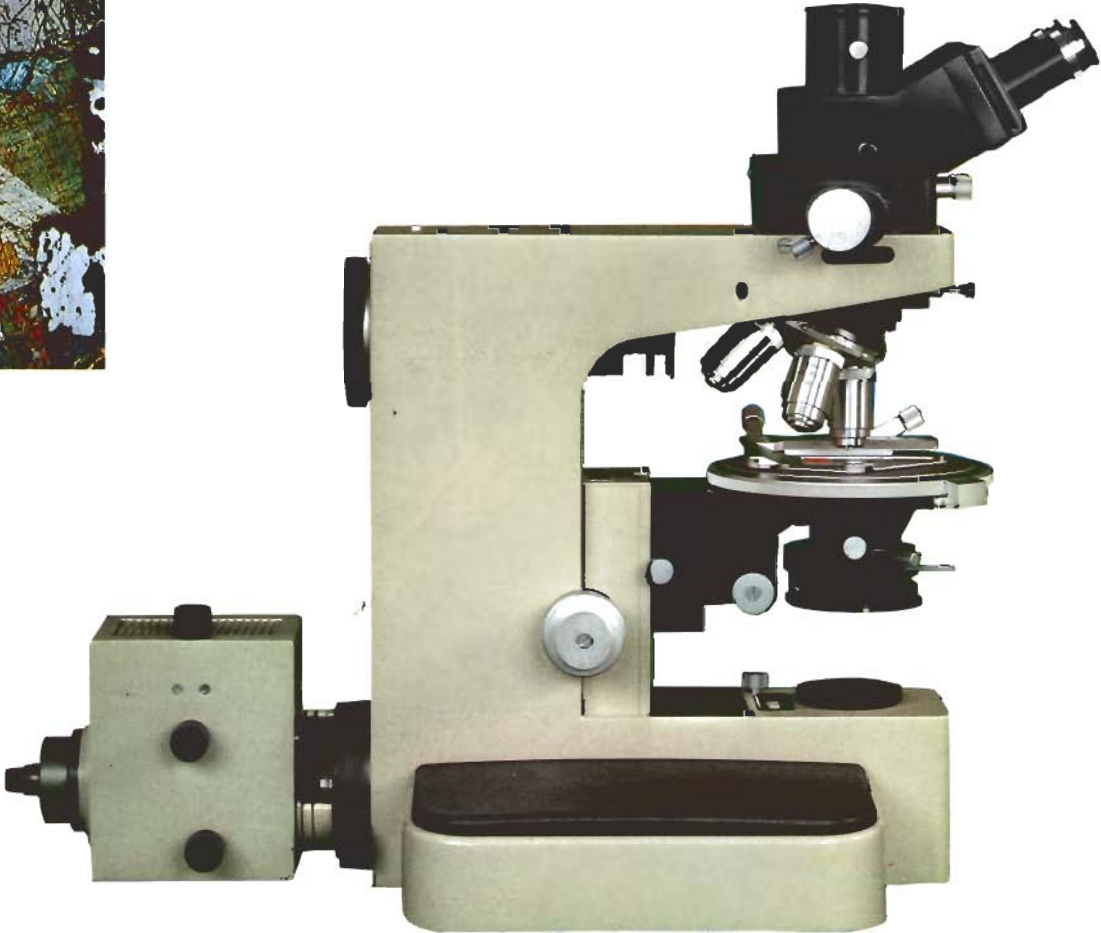
POLARIZING MICROSCOPE



Leica

Leitz ORTHOPLAN®-POL Polarizing microscope

ORTHOPLAN-POL equipped for transmitted light

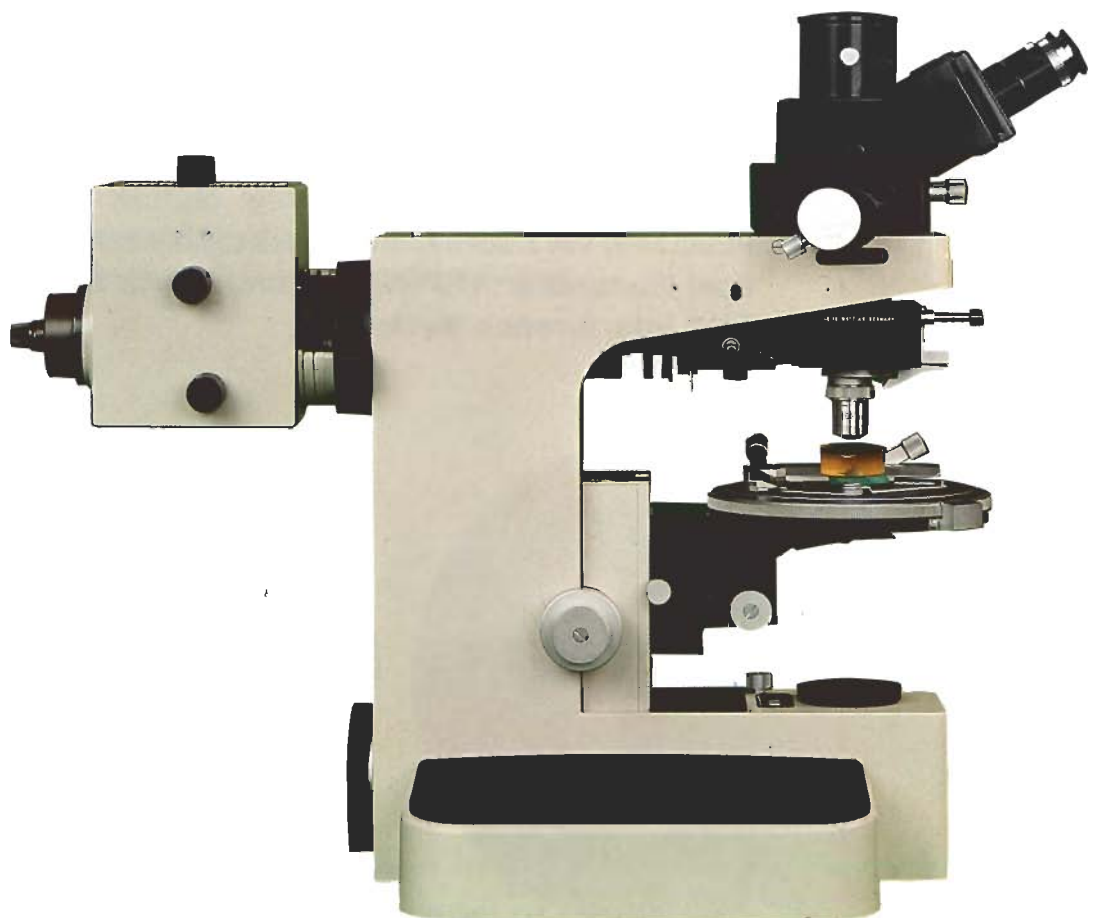
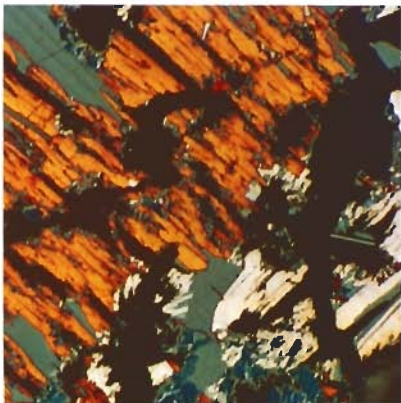
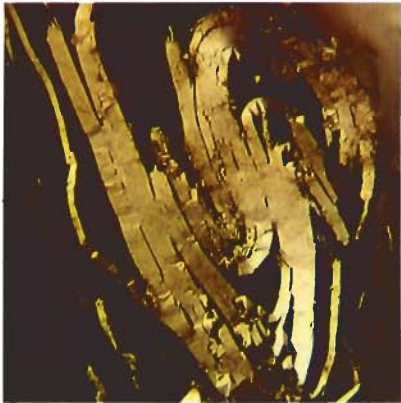


equipped for incident light

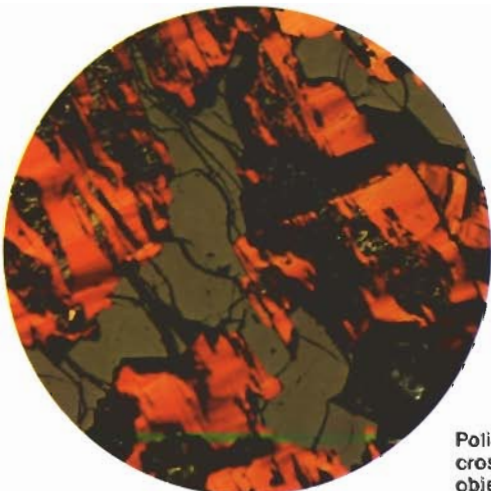
The microscope for the examination of transparent and opaque objects with all known methods of illumination and optical contrasting is called the

ORTHOPLAN.

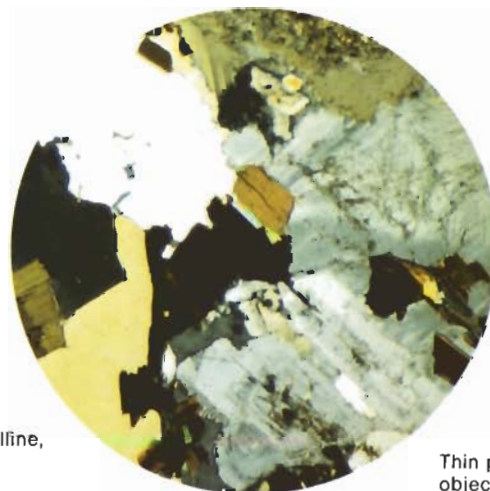
Facilities for rapid extension and adaptation to the problem to be solved have been incorporated in this instrument as basic features. The **ORTHOPLAN-POL** is one of the important variants equipped for the observation and measurement of isotropic and anisotropic specimens in polarized transmitted and incident light.



- Stand:** Large research microscope for all work in polarized transmitted and incident light, with changing facilities for the mechanical and optical components, coaxial coarse and fine focusing control acting on the object stage, on both sides of the stand.
- Light sources:** Lamp housing for filament lamps or tungsten filament lamps of up to 100W and spectrum lamps, interchangeable with lamp housing for gas discharge lamps of up to 450W.
- Condensers:** With optional filter or prism polarizer. Rotatable through 360°; interchangeable condenser tops, slot for a $\lambda/4$ -plate, index adjustment, aperture diaphragm.
- Object stage:** Rotating, running on ball bearings, with verniers and friction clamp, dia. 150mm, 45° interval clickstops, interchangeable with special stages.
- Objective carrier:** Quintuple revolving nosepiece providing for individually centrabable objectives; objective centring clutch; pol-vertical illuminator; PLOEMOPAK fluorescence vertical illuminator, metallographic vertical illuminator; HD (darkground) vertical illuminator or incident-light interference devices.

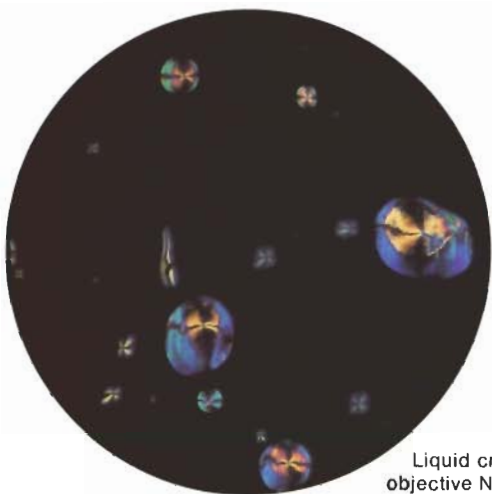


Polished ore section, covellite,
crossed Nicols,
objective: NPL 10x/0.20 P

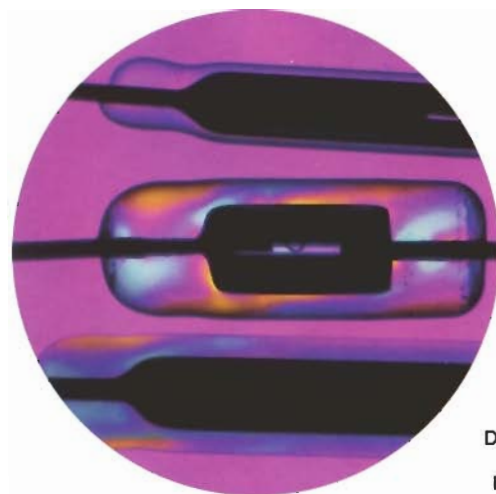


Thin polished rock section,
objective NPL 6.3/0.20 P

- Objectives:** Strainfree PL and PL FLUOTAR[®] plano objectives for transmitted light or NPL FLUOTAR for incident light. Achromatic oil immersion objectives for incident light.
- Analyser:** Rotatable through 360°, with disengageable neutral-density filter.
- Tubes:** FSA 50 binocular phototube, also for binocular conoscopy, centring and focusing Bertrand lens, additional lens and diaphragm for the conoscopy of small grains. FSA 50/30 R binocular phototube with fade-in of format outline marks.
- Micro-projection:** With light sources of up to 450W.
- Photomicrography:** With fully automatic or non-automatic cameras for 35mm or large format.
- Microphotometry:** With Leitz MPV microscope photometer system.
- Image analyser:** With Leitz Image analyser CBA 8000.
- Accessories:** Universal rotating stages, heating stages 80, 350, 1350, 1750; transmitted-light interference devices.



Liquid crystal (MBBA),
objective NPL 6.3/0.20 P



Glass to metal
seals
(Reed contacts),
photographed
with low-power
device (Bertrand
lens as objective
and low-power
condenser, *i*-plate)
(All photographs by
Dr. W. Patzelt, Wetzlar)
Cover photograph
by D. Kristen, Wetzlar

Leitz ORTHOPLAN®-POL

Structural components and accessories

Binocular phototube FSA 50

Universal tube for binocular observation and photography with the ORTHOPLAN-POL. Its characteristics: optical-length compensation for constant image sharpness at any interpupillary distance, analyser rotatable through 360°, with grey filter in the empty aperture of the analyser slide, orientation of the analyser to DIN 58879, multi-element achromatic Bertrand lens for binocular conoscopic observation, also suitable for use as a weakly reducing objective in combination with the low-power condenser. Pinhole stop for the conoscopy of small granules. Code-No. 552 166

The two possibilities of the FSA 50:

1. 100% of the light for observation
2. 100% of the light for photography

FSA 50/30 R binocular phototube with fade-in of format outline marks

This tube incorporates all advantages of the FSA tube. The additional fade-in device superimposes the outlines of the various photographic formats optically as bright lines on the microscopic image when the VARIO ORTHOMAT™ camera system is used. The various possibilities of the FSA 50/30 R:

1. 100% of the light for observation
2. 90% for photography, 10% for observation
3. 50% for photography, 50% for observation.

Code No. 552 263

Objective carrier and illuminators

All objective carriers and illuminators are horizontally interchangeable on the stand.

Objective centring revolving nosepiece

Quick-change facility for 5 objectives on revolving nosepiece running on ball bearings, individual centring facility for each objective; the objective remains centred until it is unscrewed. Two 20mm x 6mm tube slots angled at 90° are inside the built-in intermediate optical system of the revolving nosepiece; the 1x intermediate optical system is arranged so that the compensators are in the parallel beam. As a result no image displacement occurs when the compensator is inserted or removed.

A supplementary lens that can be inserted in the optical path and centred is provided for the conoscopy of small granules. Code-No. 552 277

Objective centring clutch

Accepting a single objective. Tube slots and 1x intermediate optical system as with the revolving nosepiece. Use: preferably for universal rotating stages and specimen preparation. Code-No. 552 273

Objective centring clutch with NPL plano objective



Pol-vertical illuminator

For work in polarised incident light. Equipped with optical flat and compensating prism according to Berek: optical flat for high resolution, prism for high degree of polarisation. (For investigations in combined incident-light brightfield and fluorescence a dichroic beam-splitting mirror for U.V. or blue fluorescence can be built in instead of an optical flat in the factory). The objectives are interchangeable on the centring clutch of the vertical illuminator, centring and exchange facility from the front; centring field diaphragm and vertically adjustable aperture diaphragm in the light tube; tube lens system 1x; choice of filter or prism polariser.

Vertical illuminators for special investigations

The following vertical illuminators are available:
Leitz PLOEMOPAK fluorescence vertical illuminator;
HD vertical illuminator for darkground and brightfield,
metallographic vertical illuminator,
incident-light microscope interferometer.

See special lists.

Object stage and attachable mechanical stages

Object stage No. 837

Rotating stage running on ball bearings as standard stage for the ORTHOPLAN POL; diameter 150mm, interchangeable, graduated in degrees with verniers, 45° interval click stops, adjustable friction and clamping, centre plate can be taken out.

Code No. 552 167

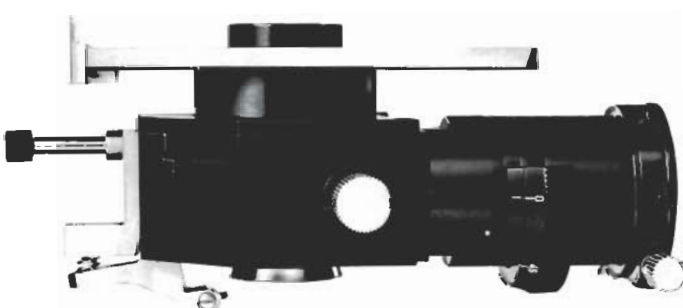
The screw-on multiformat object guide pol

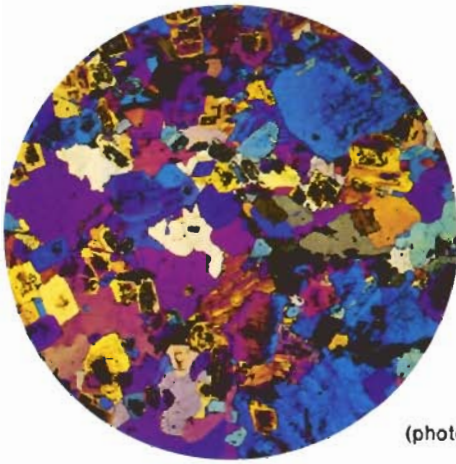
Accepts microscope slides up to 50mm x 50mm and 26mm x 76mm, and has an adjustment range of 30mm x 40mm. The coordinates of object points set can be read to an accuracy of 0.1mm off a millimeter scale with 1/10° verniers.

An interchangeable pair of catch buttons for a clickstop interval of 2mm in the X and Y direction forms part of the basic outfit of the object guide. For systematic scanning of objects and for point counting methods catch buttons for distances of 0.1mm; 0.3mm; 0.4mm; and 1mm are available as accessories.

Code-No. 553 428

Pol-vertical illuminator





Thin polished section of granite, with λ -plate, objective PL 2.5/0.08 P (photograph by Dr. W. Patzelt, Wetzlar)

Polarizing condensers

All polarizing condensers of series 700 consist of the bottom part with condenser lens, aperture diaphragm, polarizer rotating through 360°, slot for $\lambda/4$ -plate, and the interchangeable condenser top. The index mark for the zero position of the polarizer can be readjusted.

Polarizing condenser 702 fi

Standard condenser for the ORTHOPLAN POL. Equipped with achromatic condenser top A 0.90 and filter polarizer
Code No. 552 203

Polarizing condenser 702 fvi

Recommended for intense light sources such as gas discharge lamps. An interference polarizer is fitted in front of the filter polarizer. Otherwise as 702 fi.

Code No. 552 205

Polarizing condenser 702 pi

This variant has a prism polarizer. Otherwise as 702 fi
Code No. 552 204

For conoscopic investigations with immersion objectives of large aperture the condenser top No. 004 P Oil 1.33 is required.
Code No. 552 128

Pol condenser 702 fi with condenser top A 0.90



Low-power polarizing condenser for objective PL 1/0.04 P

This condenser is required for use with the PL 1/0.04 P objective. It is covered by the Code No. of this objective.
Code No. 552 158

Compensators

Leitz compensators are designed for use in the slot of the objective carrier where they are in the infinity beam of the tube lens system. This guarantees that the values obtained can be used without correction and that no image displacement is caused by the crystal plate. The dimensions of the compensator slides are 20mm x 6mm, which ensures firm support, and sufficiently large dimensions of the crystal plates to avoid vignetting. The recess at the end of the compensator makes the observation of the specimen possible without compensator plate; the slide may remain in the microscope.

The following compensators are available: Code No.

$\lambda/4$ -plate 553 387

λ -plate 553 388

Quartz wedge 1st – 4th order 553 188

λ -plate in sub-parallel position. This makes the demonstration of weak birefringence possible. In the slide the plate can be rotated through a few degrees against the normal position so that the most favourable effect can be chosen.
553 195

Pol low-power condenser



$\lambda/4$ -plate for circular polarization

Birefringent objects exhibit the well-known extinction effect when they are rotated. Especially with low powers, some such objects will always be accidentally in this position. If all objects are to be observed simultaneously in their interference colours, circularly polarized light is used. To obtain this, the above-mentioned $\lambda/4$ -plate is inserted in the condenser slot 702 in addition to the ordinary $\lambda/4$ -plate

Code No. 513 090

$\lambda/4$ -plates for measurements according to SENARMONT

Measuring range 1λ

Code No. 553 197

Filters p. 10

Rotary compensator according to Brace-Koehler

For precision measurements of very small phase differences.
Measuring range to $\lambda/10$

Code No. 553 185

Tilting compensators B and E (according to Berek and Ehringhaus).

Equipped with a magnesium fluoride and quartz double plate respectively. The phase difference can be determined from the sum of the two tilting angles at higher accuracy than with the calcite compensator without intermediate calculation.

Measuring range about 5λ (B)

Code No. 553 180

Measuring range about 20λ (E)

Code No. 553 397

Tilting compensator K (according to Berek)

This compensator is equipped with a calcite plate.

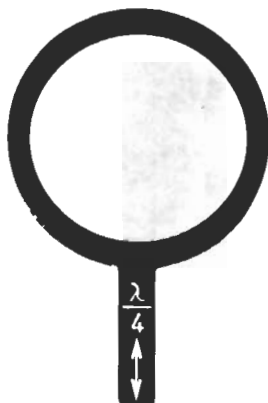
Measuring range up to about 10λ

Code No. 553 181

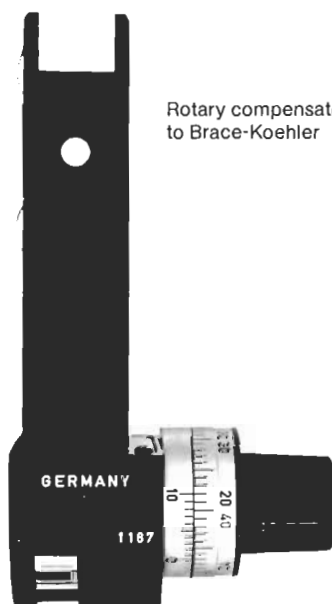
Measuring range up to about 30λ

Code No. 553 182

$\lambda/4$ -plate for circular polarization

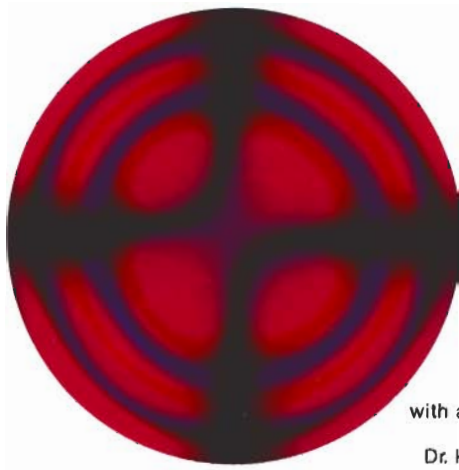


Rotary compensator according to Brace-Koehler



Tilting compensator





Synthetic ruby,
vertical to the axis,
objective NPL 25/0.50,
with achromatic Bertrand lens
(photograph by
Dr. K. Medenbach, Biebertal)

Lamp housings and filters

Lamp Housing 100

Standard illuminating device for the ORTHOPLAN POL. Suitable for the following lamps: 12v 60W precentred filament lamp, 12v 100W tungsten halogen lamp, spectrum lamps.

Uses: Observation and photomicrography on black-and-white and colour film.

Lamp Housing 100Z

Lamp Housing with centring reflector for perfectly uniform illumination. Suitable for the following lamps: 12v 100W tungsten halogen lamp, 75W xenon lamps, 100W mercury lamps, spectrum lamps. Additional low-voltage illuminators can be connected for alternative illumination via a mirror housing.

Uses: Observation and photomicrography on black-and-white and colour film, television microscopy, phase difference measurements in monochromatic light, fluorescence microscopy.

Lamp Housing 250

This lamp housing can be used in conjunction with the Mirror Housing 250S or Mirror Housing 500 on the ORTHOPLAN POL for transmitted or incident light. The following lamps can be used: 150W xenon lamps, 200W mercury lamps, and 250W halogen arc lamps.

Uses: Observation, photomicrography, and projection. Fluorescence microscopy.

VERIL S 200 interference graduated filter

Filter for continuous isolation in the spectral region between 400nm and 700nm. Length 200mm, half-value width about 12nm. It is supplied in a holder and inserted in the foot of the stand. Code No. 553 097

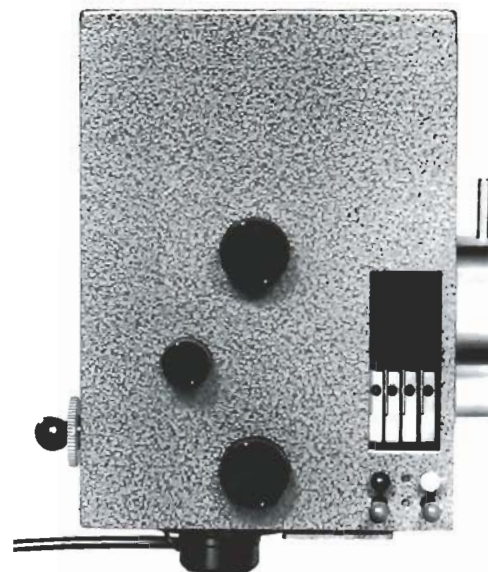
Precision interference line filter

The line filter has a half-value width of about 12nm and maximum transmission of about 30%. The diameter is 32mm; it is supplied in a holder.

Interference filter IL 546nm

Code No. 563 155

Lamp Housing 250



Interference

Incident-light interference contrast device R

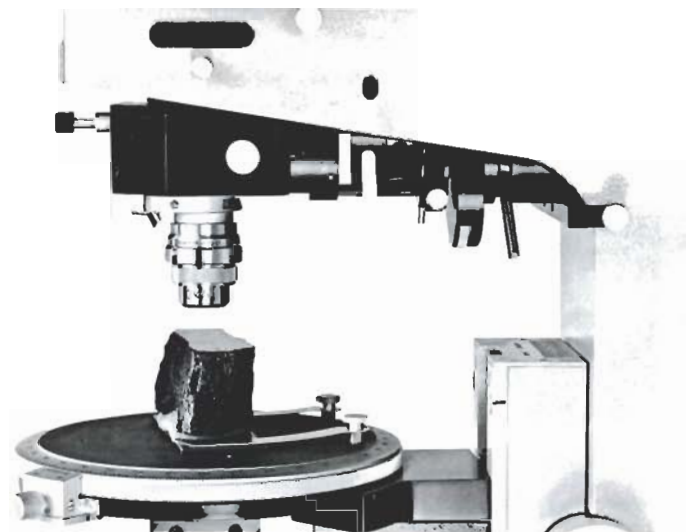
This device functions on the same principle as the transmitted-light device.

Uses: Surface testing of polished sections, metals, glasses, ceramics, varnishes, synthetic materials.

Outfit:	Code No.
Polarizer with pre-polarizer	553 235
Objectives NPL FLUOTAR 10x/0.20P	559 254
NPL FLUOTAR 20x/0.40P	559 256
Wollaston prism for NPL FLUOTAR 10x objective	553 459
Wollaston prism for NPL FLUOTAR 20x objective	553 460

Other objectives of up to 125x as accessories.

Interference contrast device R



Leitz ORTHOPLAN®-POL

Other instruments for polarized-light microscopy

Universal rotating stage

The UT 5 rotating stage is used for crystal optic investigations according to FEDOROV. The UT 5 rotating stage has, compared with the standard universal rotating stage with only 4 axes, the advantage that the second plane of symmetry can be immediately set after the first one has been found. This considerably simplifies and shortens the measuring procedure. The UT 5 has a practical device for the interchange and attachment of the polished sections and permits effortless setting of the surface of the polished section in the point of intersection of the axes of rotation. For structural investigations it is useful to fit the UT 5 stage with the slide according to SCHMIDT for the parallel displacement of the specimen, which, however, requires a modified mount of the upper segment.

For the universal rotating stage method the use of the UT special objectives is necessary; these are all corrected for the same working distance from the segment (1.5mm), and equipped with an iris diaphragm. The objectives UT 16/0.35 and UT 32/0.30 of larger aperture call for the use of a special supplementary condenser.

Outfits:

Universal rotating stage UT 5, 5 rotating directions, with centring device, without upper segments, storage case including. Code No. 553 417

Parallel guide slide according to SCHMIDT, graduated in mm, for the displacement of the thin polished section below the segment, required for structural analysis with universal rotating stages Code No. 553 009

Objectives for universal rotating stages p. 15

UT 5 universal rotating stage



Projection attachment on the ORTHOPLAN-POL



The ORTHOMAT E[®] camera system

The Leitz ORTHOMAT E is unique in its number of user-friendly functions, such as the automatic exposure control, the picture formats, the zoom eyepiece and the binocular photo tube and the data reflection for all formats. Not forgetting its compact and modular design, which makes it easily attachable to Leitz microscopes.

Outstanding photomicrographic performance is a matter of course for the ORTHOMAT E. What's more, you will find that the superb quality of the pictures will make all the difference to your documentation.

Reciprocity-failure compensation

Six different compensation factors matching the most commonly-used film types.

Film speed range

Film speeds from 3 to 8000 ASA are accommodated.

Multiple exposures

By simply switching the film transport system off.

Exposure memory

An automatically-determined or manually-input shutter speed can be stored.

Fixed shutter speed

Any shutter speed from 0.01 sec up to a maximum of 99 min. can be set manually.

Sequences

For series exposures, where a constant interval between pictures is required. Ideal for growth processes or cell division.

Exposure metering

Integral or spot metering via photomultiplier.

The exposure time can be stored and measured before and during each exposure.

Percentage object coverage

Adjustable from 20% to 100% in 20% steps for light or dark background. In this way, even the smallest components can be precisely exposed.

Micro-projection attachment

This device is very useful for the quick and convenient examination of series of specimens and demonstration to a small number of persons. It is inserted in the photo-tube of the FSA tube. The image is seen right-way-round and sharp throughout the field; diameter 150mm.

Code No. 513 138

WILD MPS Modular Photomicrographic System

The WILD MPS 12 Microcamera is for serial photography at constant exposure times and for Polaroid photography.

The WILD MPS 05/12 Mikrophot consists of the WILD MPS 05 Exposure Meter and the MPS 12 Microcamera (choice of integrated or spot metering).

The WILD MPS 15/12 Semiphotomat has a wider film speed range and a greater choice of settable variables than the MPS 05/12.

The WILD MPS 46/52 Photoautomat is for integrated metering and spot metering and has the option of a stored fixed time.

All of these systems are usable with any conventional film format. The Photoautomats advance 35mm film automatically. For photography with linearly-polarised light the quartz plate (386 686) must be fitted in the shutterpiece.

Appropriate brochures contain further details.

Micro-hardness testing

Hardness tests according to VICKERS or KNOOP can be carried out quickly and rapidly with the automatic micro-hardness tester. List 560-36.

Heating-stage microscopy

Microscope heating and freezing stage 80 for temperatures between -20° and $+80^{\circ}$ C; List 515-008

Microscope Heating Stage 350 for temperatures up to 350° C; List 515-033

Microscope Heating Stage 1350 for high-temperature microscopy; List 515-073

Microscope Heating Stage 1750 for high-temperature microscopy in vacuo or in a protective atmosphere; List 515-068.

With the exception of the Heating Stage 80, special objectives of long working distances are required for heating stages.

Hand press

For the embedding in plasticine of polished sections of about the same thickness and their vertical alignment to the optical axis. The specimens are arranged at the same level, so that after specimen change only slight refocusing may be required.

Code No. 563 035

Stage micrometer

For incident light (1mm graduated in 100 intervals)

Code No. 563 011

For transmitted light (2mm graduated in 200 intervals)

Code No. 513 106

Screw micrometer eyepiece

With the screw micrometer eyepiece a much higher measuring accuracy can be obtained than with the conventional micrometer eyepieces. It is inserted in the tube in place of the conventional eyepiece.

metric

Code No. 810 231

English

Other accessories, such as correction pol condenser, fluorescence vertical illuminator, groups of instruments for microphotometry, image analysis, cathodo-luminescence, on request. Special descriptive literature is available.

Leitz ORTHOPLAN®-POL

Objectives and eyepieces

Strainfree objectives for transmitted-light microscopy

170/0.17/45mm

Type of objective	Engraved	Reproduction ratio/aperture	Free working distance mm	Cover glass correction 1)	Adjustment length in mm	Code No.
Strainfree plano objectives PL P	PL 1	0.04 (P) with iris	30	-	67.5	559 065*
	PL 2.5	0.08 P	11	-	45	559 183
Strainfree plan-achromats PL FLUOTAR P	PL FLUOTAR 6.3	0.20 P	2.0	-	45	559 172
	PL FLUOTAR 16	0.45 P	0.80	0.17	45	559 262
	PL FLUOTAR 25	0.60 P	0.51	0.17	45	559 259
	PL FLUOTAR 40	0.70 P	0.45	0.17	45	559 226
EF-plano objectives	PL FLUOTAR 100	1.32 OEL P	0.17	0.17	45	559 240
	EF 50**	0.85 P	0.40	0.17	45	559 268

* Objective including condenser
** Particularly recommended for conoscopy

1) 0.17: to be used with 0.17mm coverglass
-: can be used with or without coverglass

Objectives for universal rotating stages

Designation /reproduction ratio /aperture for use with segment nD 1.55 Transmitted light tube length 170	Adjustment length in mm	Free working distance in mm	Reproduction ratio /aperture for use without segment Transmitted light tube length 170 coverglass correction: -1)	Adjustment length in mm	Free working distance in mm	Code No.
UT 6.3/0.18	45	7.11	L 4/0.12 P	45	24.1	559 125
UT 16/0.35	45	2.27	L 10/0.22 P	45	15.8	559 141
UT 40/0.34	45	1.20	L 25/0.22 P	45	14.7	559 123
UT 32/0.50	45	1.00	L 20/0.32 P	45	6.7	559 122
UT 50/0.62	45	0.67	L 32/0.40 P	45	6.5	559 124

1) -: can be used with or without coverglass

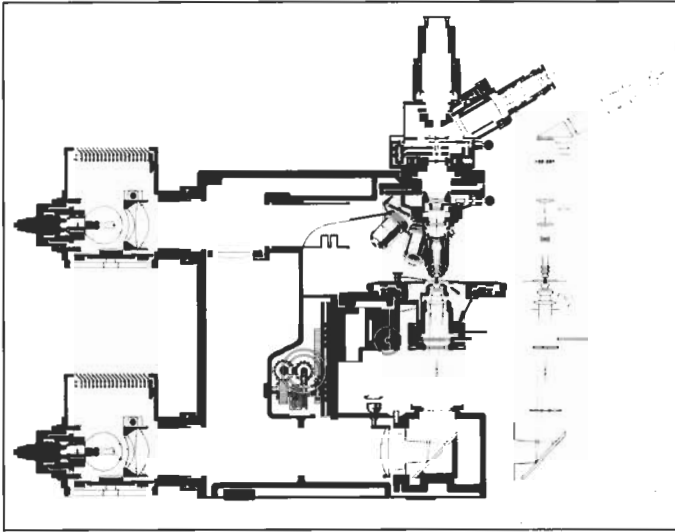
Strainfree objectives for incident-light microscopy

∞/0/30mm (except Pos. 1:63 and Pos. 2 = 39mm)

Type of objective	Engraved: reproduction ratio / aperture	Free working distance mm	Coverglass correction 1)	Code No.	
Plan-achromats NPL P incident light	PL	2x0.04	18.4	-	559 182
	* NPL	5x0.09 P	12	-	559 194
	* NPL FLUOTAR	10x0.22 P	11.8	-	559 253
	* NPL FLUOTAR	20x0.45 P	2.31	-	559 255
	* NPL FLUOTAR	50x0.85 P	0.24	O	559 222
	* NPL	100x0.90 P	0.10	O	559 244
Immersion systems incident light		20x0.40 OEL P	0.46	-	559 083
		32x0.65 OEL P	0.30	-	559 084
		50x0.85 OEL P	0.35	-	559 248
		125x1.30 OEL P	0.28	O	559 114

1) -: can be used with or without coverglass
O: to be used without coverglass

* Can also be used for interference contrast R



Cross section of ORTHOPLAN-POL with optical path (transmitted light).

PERIPLAN® eyepieces, with crosslines, dia. 23.2mm

Magnification	Field of view mm	Code No.	
		Single	Pair
* 10x ϕ with cross lines	18	559 241	559 240
10x ϕ M	18	519 741	

* With orientated cross lines and graduation (10mm = 50 intervals)

Special Eyepieces, Micrometers

PERIPLAN GF 10x ϕ eyepiece	519 741
20-point graticule according to Koetter	519 977
Stage micrometer for transmitted light 2mm = 200 intervals	513 106
Stage micrometer for incident light 1mm = 100 intervals	563 011
PERIPLAN GF 12.5x MF eyepiece with SY 2 graticule for the attachment of the WILD MPS photo system	519 465
PERIPLAN 10x M ϕ eyepiece	519 741
Graticule with grid division 10x10mm in 0.1mm steps	519 965
Graticule with grid division 10x10mm in 1mm steps	519 966

ORTHOPLAN POL polarising microscope, transmitted light

ORTHOPLAN stand with coaxial drive, for transmitted and incident light, with centring disc	512 180
POL phototube FSA 50/30R (with fade-in of format outlines, Bertrand lens and analyser)	552 263
Centring revolving nosepiece with dovetail changer, 1x tube, 1 pair of centring keys, shutter and filter slide	552 277
Object Stage No. 837, diameter 150mm	554 167
Object guide, POL	553 428
Achromatic swing-out Condenser No. 702 fi	522 203
Rack-and-pinion drive with dovetail changer	512 534
λ -plate	553 388
$\lambda/4$ plate	553 387
Dust cover	512 173
Objectives PL FLUOTAR 6.3/0.20 P	559 172
PL FLUOTAR 16/0.45 P	559 262
PL FLUOTAR 25/0.60 P	559 259
EF 50/0.85 P	559 268
Pair of PERIPLAN 10x ϕ M high-point eyepieces with cross-lines	559 240
Lamp Housing 100 with 12v 100W tungsten-halogen lamp	514 646
Power unit for 12v 100W, continuously adjustable, with connecting cable (safety plug)	500 286

ORTHOPLAN POL polarising microscope, incident light

ORTHOPLAN stand with coaxial drive, for incident and transmitted light, with centring disc	512 180
POL phototube FSA 50/0.30 R (with fade-in device for format outlines, Bertrand lens and analyser)	552 263
Pol vertical illuminator ∞ 1x with prism	553 333
Object Stage No. 837, diameter 150mm	552 167
Object guide	553 428
Dust cover	512 173
Objectives NPL FLUOTAR 10x/0.20 P	559 253
NPL FLUOTAR 120x/0.40 P	559 255
NPL FLUOTAR 50x/0.85 P	559 222
NPL FLUOTAR 100x/0.90 P	559 244
32x/0.65 OIL P	559 084
125x/1.30 OIL P	559 114
10 ML Immersion oil in vessel	513 449
Pair of PERIPLAN 10x ϕ high-point eyepiece with crosslines and graduation	559 240
Lamp Housing 100 with 12v 100W tungsten-halogen lamp	514 594
Power unit 12v 100W, continuously adjustable, with connecting cable (safety plug)	500 248
Handpress	553 035
6 metal object slides	553 027



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