LABOVAL® 2 pol POLARIZING MICROSCOPE

CARL ZEISS JENA



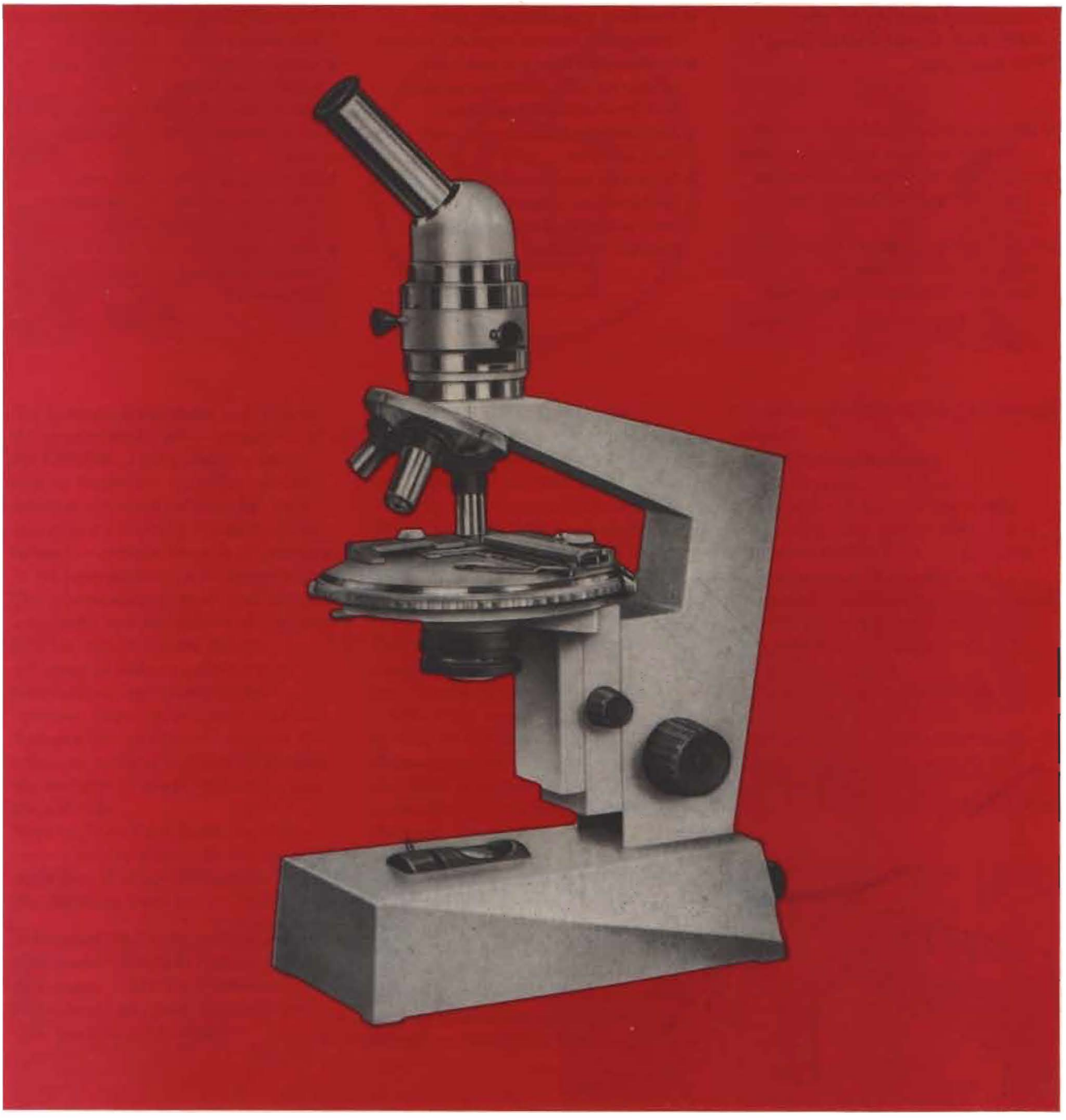
Today, more and more branches of science and industry come to employ polarization microscopy as a means for research, routine work and inspection.
Our MIKROVAL range of microscopes includes two smaller polarizing microscopes, which have been developed primarily for the purpose of introducing microscopists into the multifarious techniques of polarization microscopy and training students of geology and mining sciences but are also applicable to industrial routine and control measurements as well as for solving particular research tasks.
The LABOVAL 2 pol·d is intended for transmitted-light observation in bright field and phase contrast, whereas the LABOVAL 2 pol·u is equipped for bright-field incident-light work as well.
Since the LABOVAL 2 pol

Both models are distinguished by their sturdy stands and simple operation. They permit polarization-optical exactitude of observation and accuracy of measurement with the simpler test methods.

Polarizing Microscopes are integrated within the modular MIKROVAL system, a vast range of accessories is available to extend their applications.

LABOVAL 2 pol·d
Polarizing Microscope

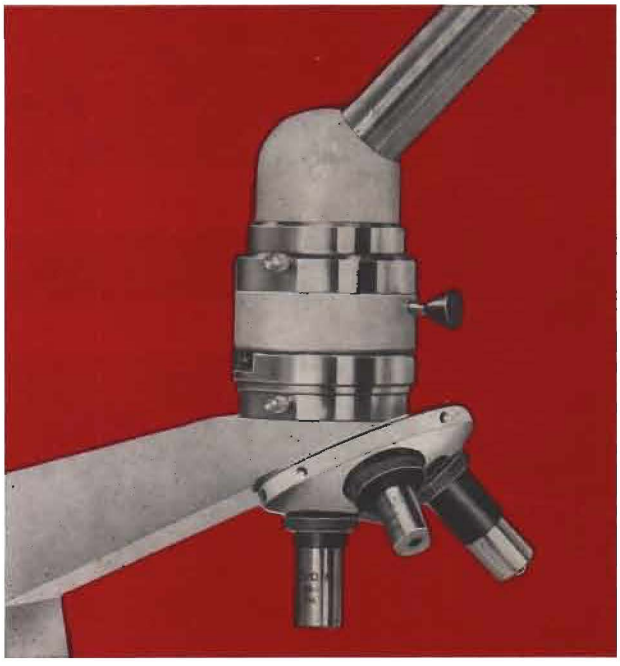
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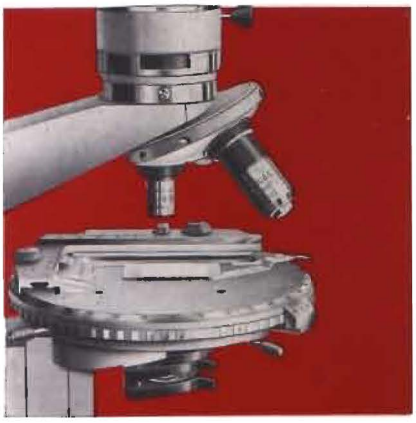
Prominent merits of the LABOVAL 2 pol Polarizing Microscopes:

- Low-positioned single-knob control for coarse and fine stage adjustment
- Large factory-centred ball-bearing stage with graduation and two verniers
- Attachable graduated object traverser, 22 × 44 mm, no restriction of nosepiece revolution
- Revolving nosepiece with three individually centred objective fixtures
- Intermediate tube pol with telecentric ray path, interchangeable with incident-light equipment
- Permanently oriented swing-out filter analyzer
- Polarizing condenser with rotating polarizer and hinged wide-field lens, interchangeable with phase contrast condenser
- Filter polarizers of high extinction and largely neutral transmission
- Compensators for qualitative and quantitative studies
- Strain-free Achromat pol objectives for transmitted and incident-light work
- Focussing eyepieces, with cross-hairs aligned with the vibration directions of the polarizers
- Microscope base with built-in low-voltage lamp and variable transformer

2



3





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The **intermediate tube pol** (Fig. 2) is the significant optical component of the LABOVAL 2 pol polarizing microscopes. It contains the swing-out filter analyzer arranged between two Telez lenses in a telecentric ray path. Closely below the analyzer there is an opening in the tube which accepts compensators. The intermediate tube pol also contains a Bertrand lens for indirect observation, which is matched to the 40/0.65 achromat to such an extent that a well-defined interference pattern becomes visible immediately after the Bertrand lens has been inserted. An adjusting screw is provided for keeping the analyzer in correct alignment with the polarizer.
The LABOVAL 2 pol Polarizing Microscopes employ achromatically corrected objectives in strain-free mounts.
The following types are provided:

Achromat 3.2/0.10 160/– pol
Achromat 6.3/0.16 160/– pol
Achromat 10/0.25 160/– pol
Achromat 40/0.65 160/0.17 pol
with specimen protection

The objectives of type 160/– are suitable for both transmitted and incident light, whereas the 160/0.17 one is designed for transmitted light only. The objectives are parfocalized. With A 10× and A 16× eyepieces, the magnification range covered is 32 to 640× for transmitted light and 63 to 320× for incident light.

The
revolving stage (Fig. 3)
permanently centred at the factory has a scale which reads to 0.1°. It is running on ball-bearings, thus being characterized by a very small torque. The stage is provided with holes for stage clips and the attachable object traverser. The object traverser has a range of movement of 22 mm × 44 mm. It accommodates slides of 28 mm × 48 mm and 26 mm × 76 mm.
The polarizing condenser has a maximum N. A. of 1.2. It is provided with an adjustable aperture stop and a hinged large-field lens. The polarizer may be rotated through more than 180°; its zero position being fixed by a click stop.

The standard LABOVAL 2 pol equipment includes
λ and $\lambda/4$ **compensators**
as well as a $\lambda/2 \ldots 3\lambda$ wedge compensator. A $0 \ldots 6\lambda$ measuring compensator with quartz combination plate after **EHRINGHAUS** is provided for measuring path differences on transparent birefringent objects. A table supplied with the compensator lists the path difference for direct reading without computation.
A λ-compensator in sub-parallel position serves for high-contrast representation of slightly anisotropic objects, particularly under incident light conditions.

Brass Ms 63, electrolytically polished, incident light – bright field, crossed polarizers, M = 240×

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LABOVAL 2 pol·u
Polarizing Microscope

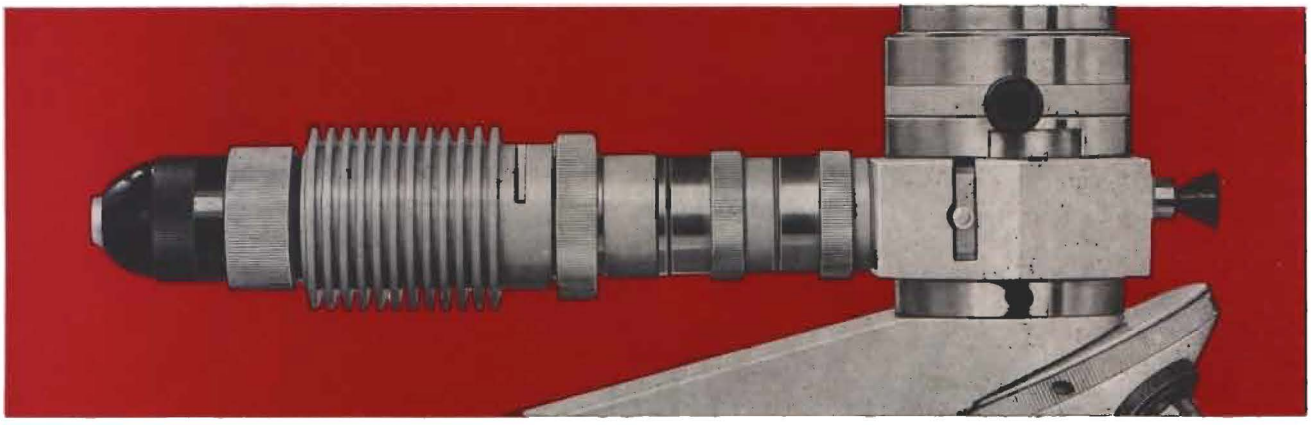


Karlsbad salt
transmitted light – bright field, crossed polars,
M = 320×

7



8



Where absorbing substances in the form of ground and polished sections are to be examined, the intermediate tube

pol of the LABOVAL 2 pol·u

can be replaced by an incident-light equipment (Fig. 8). The equipment is arranged in accordance with the KÖHLER illumination principle, containing adjustable diaphragms which limit the luminous field and the illumination aperture. The source ist a 6-volt, 15-watt flat-core projection lamp; the equipment is, however, versatile enough to allow microscope illuminators of higher intensity to be used, e.g., for photomicrography.

Polarizer and analyzer may be brought into the ray path alternatively. They are always in crossed position, their vibration direction being optimally adjusted relative to each other at the factory. An opening in the tube arranged at 45° to the vibration direction of the analyzer accepts polarization-optical compensators for qualitative determinations.

The illumination beam is deflected by means of a semi-silvered plane glass. The 40/0.65 160/0 achromat extends the magnification range of the equipment to 640× for the purpose of structure determinations on uncovered objects in incident light-bright field.

For the quick, easy and convenient photographic recording of the images observed in the **LABOVAL 2 pol**, an attachment camera can be assembled from modular components of our

mf Photomicrographic Equipment

Mechanically, the camera is adapted to the microscope by means of an mf tube. Optical adaptation is effected by means of **4:1** and **6.3:1 mf** projectives which are inserted into the tube. The **4:1** measuring projective projects a measuring scale onto the photograph. In the case of polarizing microscopes, the attachment camera should employ the

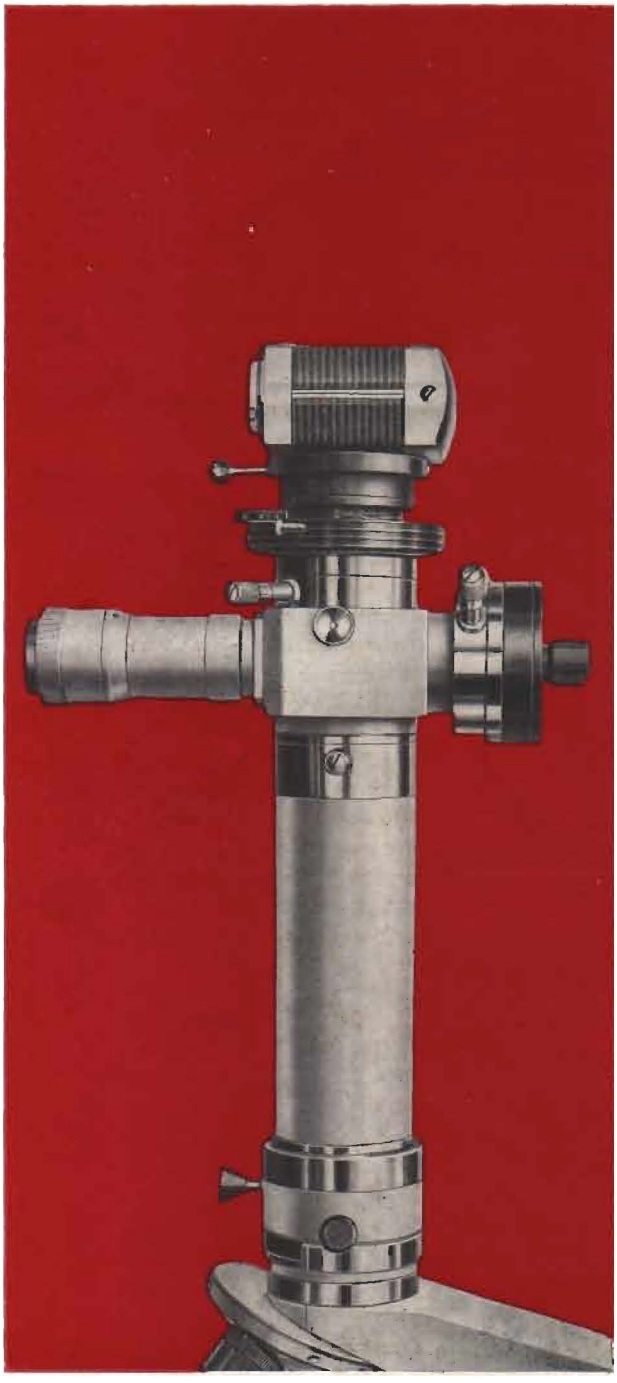
mf pol basic

body, the components of which do not interfere with the polarization-optical conditions. The basic body has a focussing system which shows a large extra field surrounding the image area covered by the camera. A built-in photocell permits to measure exposure times.

An **mf** basic body for the automatic exposure device is also available.

Both basic bodies preferably accept camera bodies for **24 mm** × **36 mm** or **6.5 cm** × **9 cm** film material.

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Cordierite gneiss from Lunzenau/Saxony, thin section transmitted light – bright field, 1 polar, M = 50×

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In tuition and training lessons, the drawing of the outlines of microscopic pictures is still of quite some importance in our days. We have seen fit therefore to design for our microscopes a moderately priced

drawing eyepiece (Fig. 11)

of easy manipulation. It is intended for tubes of 45° direction of observation and is fitted with all the merits of the ABBE drawing apparatus. The outfit consists of an 8× eyepiece and a beam-splitting cube. The drawing surface and the microscopic image can be seen critically depicted at the same time. The intensity of both the microscopic image and the drawing surface may be adapted to each other by means of light-regulating filters.

Measurement of lenghts and areas may be carried out with the aid of the

measuring eyepiece (Fig. 12)

A 10× or 12.5× or of the eyepiece screw micrometer K 15×. The measuring eyepiece A 10× (field No 14) and A 12.5× (field No 16) are arranged in such a manner that in their object plane measuring disks of different graduations may be optionally inserted. For routine measurements, the eyepiece measuring disk 10:100 with 0.1 mm reading is recommended. When using the eyepiece screw micrometer K 15× (field No 10.5) the reading accuracy is increased by the factor 10×.

In cases where objects differ from their surroundings only by thickness or refractive index, the phase-contrast method must be employed to produce sufficiently sharp contrast. It can therefore be successfully employed in determining the refractive index of mineral grains.

The

phase contrast equipment

(Fig. 13) for the LABOVAL 2 pol·d consists of an aplanatic condenser and the Phv Achromats 6.3/0.16, 16/0.32, 40/0.65 and HI 100/1.25. In addition to the application of the normal phase-contrast method, it still allows of carrying out the so-called "strict" phase-contrast method, which is more advantageous in measuring light-refraction according to the immersion method.



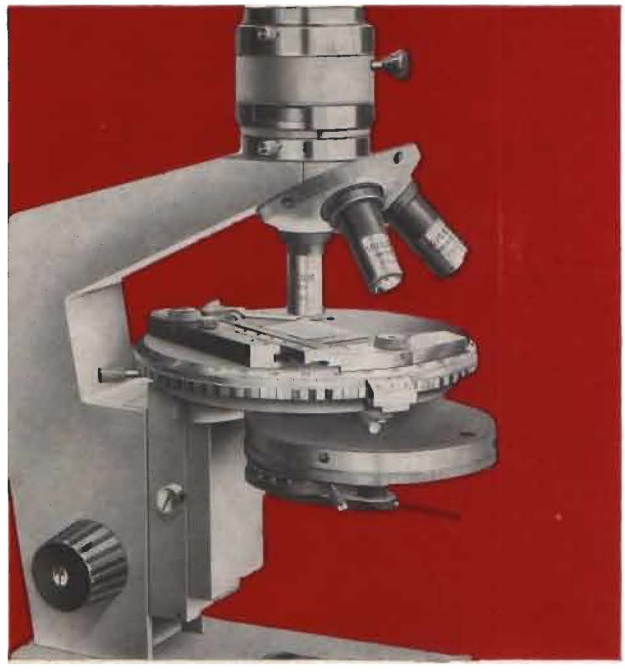
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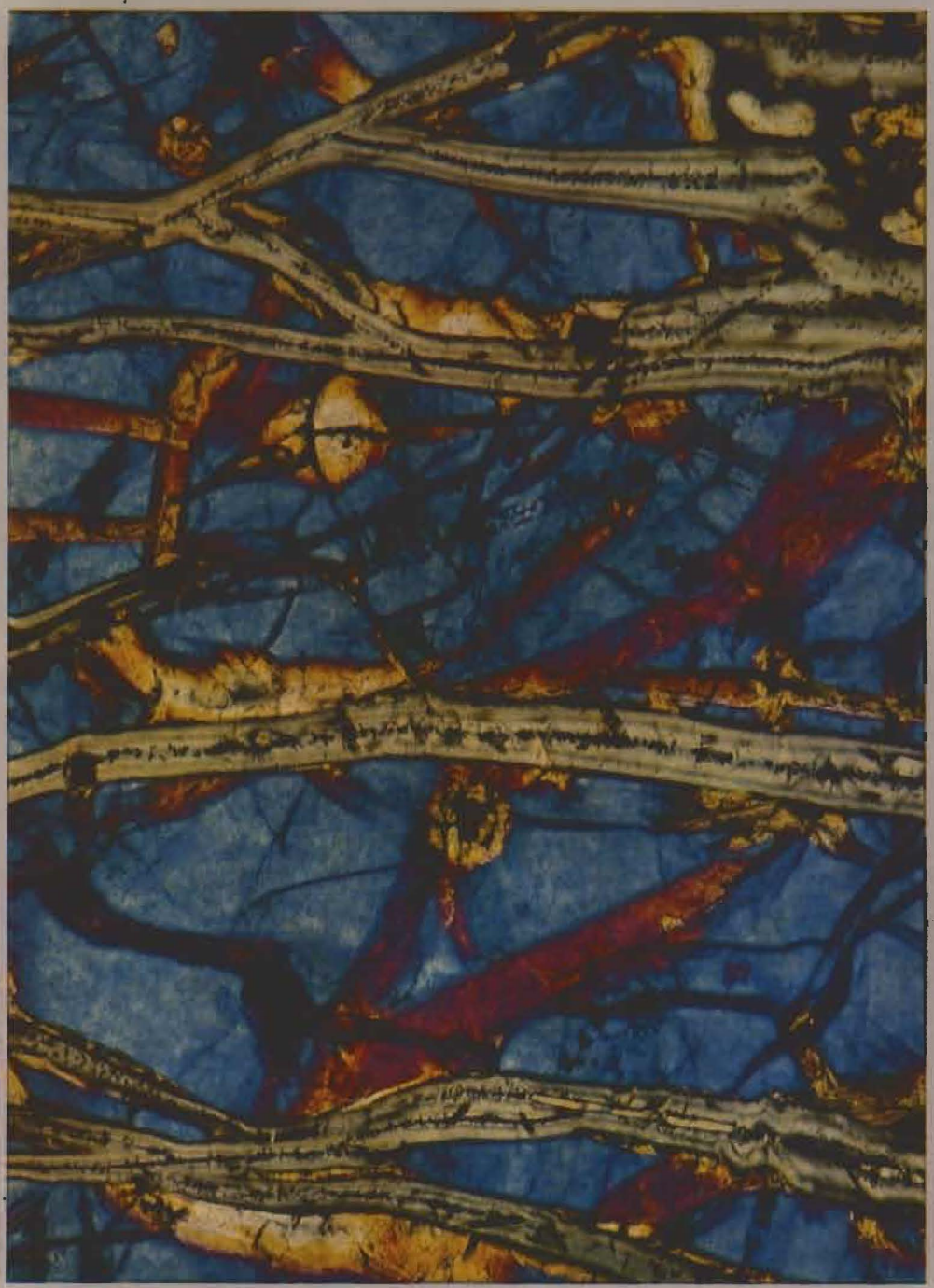


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Picrite from Schleiz, thin section, transmitted light – bright field, crossed polars, M = 200×

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Order List

Description	Cat. No

LABOVAL 2 pol-d Polarizing Microscope

comprising:

LABOVAL 2 pol stand incl. B 25 specimen stage, triple revolving nosepiece with individual centring facility for each objective, pol intermediate tube, transformer and 6 V 5 W built-in lamp	30 10 20:524.26/2
22 × 44 object traverser with scale	30 51 10:006.24/1
pol monocular inclined tube 23.2/120	30 50 29:021.24/2
1.2/0 pol condenser with swingable large-field lens	30 43 00:003.26/5
3.2/0.10 160/– pol achromat	30 22 21:002.26/1
10/0.25 160/– pol achromat	30 22 23:002.26/8
40/0.65 160/0.17 pol achromat with specimen protector	30 22 25:022.26/1
A 10× pol eyepiece	30 31 16:001.24/3
A 16× pol eyepiece	30 31 18:001.24/4
λ compensator	30 59 51:011.24/2
λ/4 compensator	30 59 51:021.24/4
λ/2 – 3 λ wedge compensator	30 59 50:001.24/1
45 × 26 centring plate, in case	30 57 23:002.26/0
frosted screen	31 07 18:002.00/5
C 311, 32 ∅ conversion filter	30 47 55:311.00/6
2 T-A 6 V 5 W filament bulbs	683.76/3
protective hood	02 95 10:113.24/2
accessories box	30 90 61:006.14/2
standard equipment	**30 00 50:051.20/5**

LABOVAL 2 pol-u Polarizing Microscope

comprising:

LABOVAL 2 pol-d in addition:	**30 00 50:050.20/4**

Incident-light equipment for LABOVAL 2 pol — 30 10 71:003.21/0

comprising:

incident-light condenser with lamp housing and collector	30 41 05:003.26/8
holder with cable F 1000	271.15/0
6.3/0.16 160/– pol achromat	30 22 22:002.26/0
C 311, 32 ∅ daylight filter	30 47 55:311.00/6
2 T-P5 6 V 15 W filament bulbs	681.34/3
A 15 VA 220/6 low-voltage transformer	680.33/4

Supplementaries to LABOVAL 2 pol

Phv phase-contrast equipment, complete	30 10 30:004.21/1
A 8× drawing eyepiece	30 56 07:010.24/8

For mf equipment
see publication No 30-605

For compensators
see publication No 30:537

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