Polarizing Microscope

INSTRUCTION MANUAL

MODEL **POS**

OLYMPUS

OUTSTANDING FEATURES

1. Simplicity in manipulation for maximum versatilities.
2. Most competitive price for maximum applications.
3. Centering device for each objective (except for 4×)
4. Complete range of extra accessories

SPECIFICATIONS:

Stand: Full size, balanced, permits 90-degree arm movement.
Coarse focusing by rack and pinion.
Fine focusing by micrometer screw.

Stage: 140 mm in diameter, rotatable through 360° (verniers reading from 6′) by means of clamp screw.

Mechanical Tube Length: 160 mm

Bertrand Lens: Swing-out type (by means of rotating handle), pre-centered.

Eyepieces: 5×, 7× (0.1 mm scale), 10×(cross-hair) with registration pin.

Objectives, Achromat: PS 4×/N. A. 0.10
PS 10×/N. A. 0.25 (w/centering device)
PS 40×/N. A. 0.65 (w/centering device)

Condenser: N. A. 1.20, iris diaphragm. Sliding mechanism to insert compensation lens.
N. A. 0.25 with compensation lens.

Polarizer: Rotatable through 90° (1 div. = 5°)

Analyzer: Rotatable through 90° (1 div. = 5°)
By means of lever, the analyzer can be slid out of the optical path.

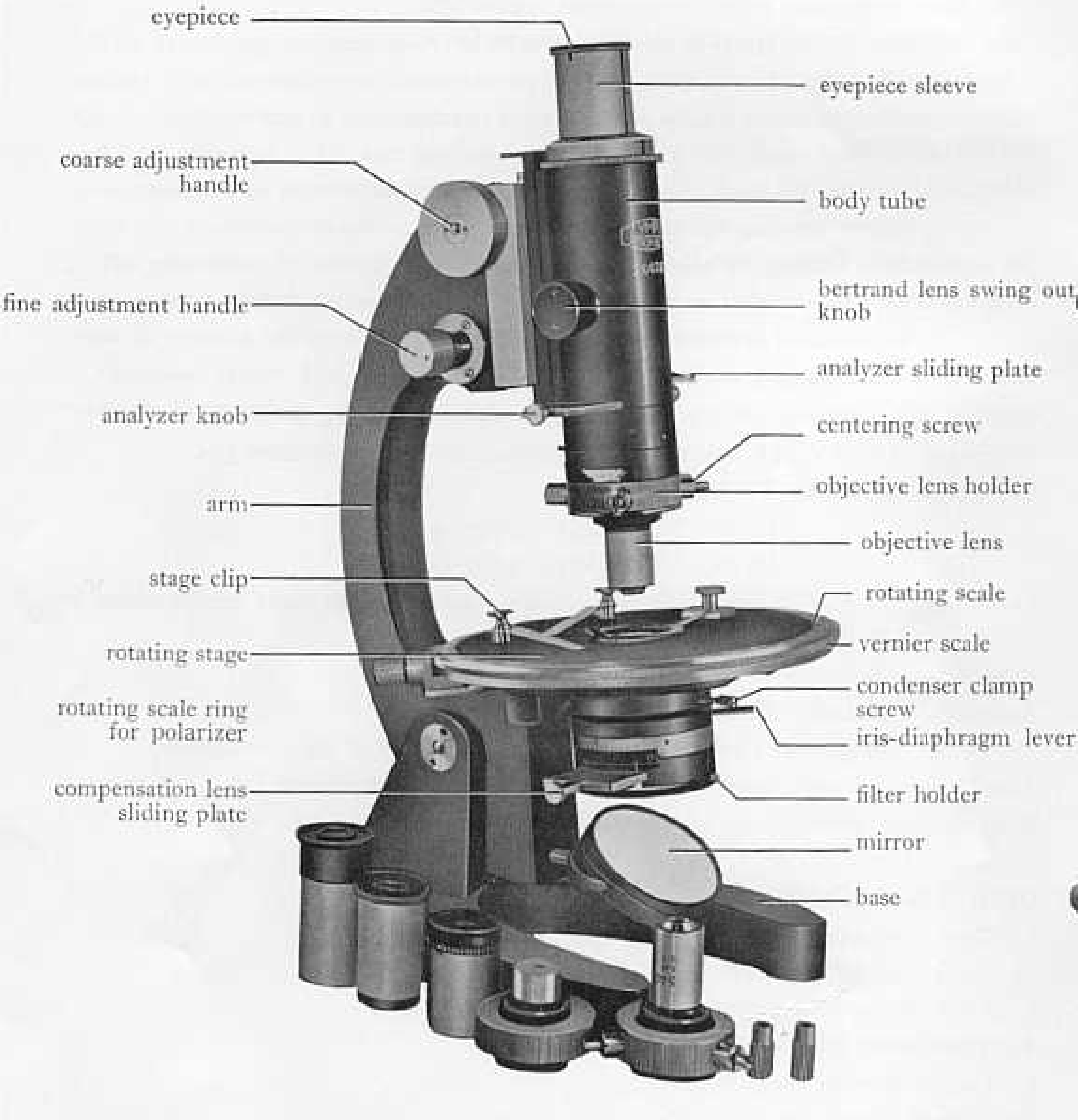
Test Plates: 1/4 wave length retardation plate (mica). Tint plate of 530 mμ (Gypsum).

Filter: Use a filter both as color compensation and daylight.

OPTIONAL ACCESSORIES

1. Cross movement mechanical stage.
2. Berek-type compensation test plate.
3. Photomicrographic equipment PM-6.
4. Transparent illuminator LSD with
5. Plug-in substage lamp LSK.
6. Vertical illuminator LSP with

MICROSCOPE PARTS



BODY PARTS

Arm and base

Since the arm attached to the base is inclinable to any angle up to 90°, observations can be made in comfort. Focusing is done by moving the tube up or down by means of the coarse and fine adjustment handles.

Mirror

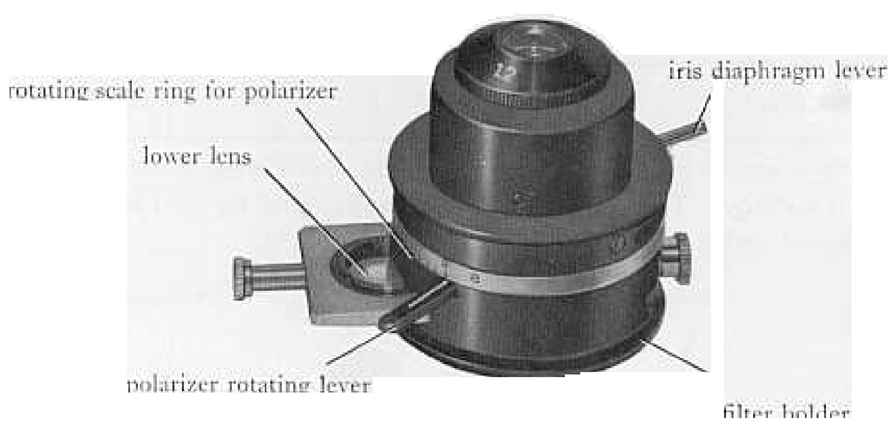
The mirror attached to the lower part of the arm can be moved freely in any direction. It should be so adjusted that it directs the light into the condenser.

Condenser

The lower lens can be slid out of the optical path, either to the right or to the left. When it is in the optical path, the numerical aperture is 0.25, suited for the orthoscopic observation and when it is out of it, the numerical aperture is 1.2, suited for conoscopic observation.

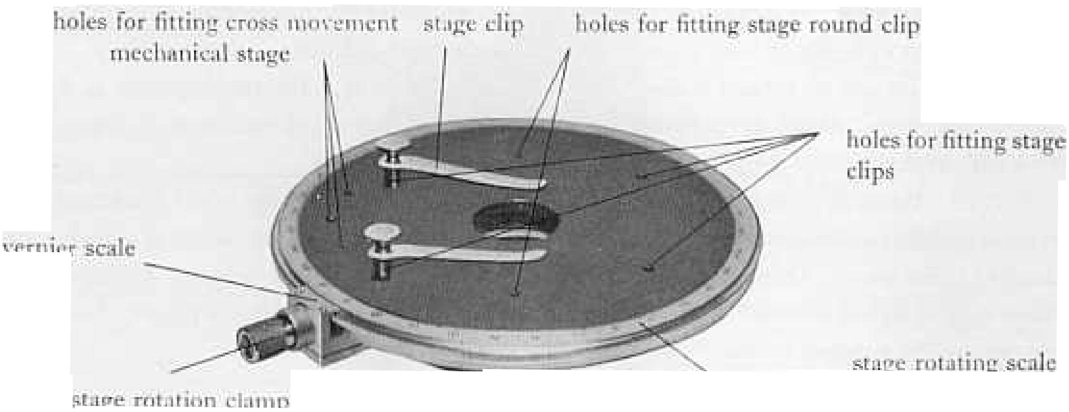
The polarizer can be rotated through 90° by means of a lever; the rotating scale is divided into 5° calibration. When the polarizer is clicked into position at 0°, its oscillation is longitudinal. The iris diaphragm can be adjusted by means of a lever.

NOTE; When attaching the condenser to the body, the registration pin of the condenser must first be fitted into the sleeve groove. The condenser is then pushed up as far as possible and clamped to the body. Otherwise, the oscillation of the condenser will be erratic. The condenser sleeve is so designed that dark field condensers and phase contrast condensers produced by other makers can be attached to the POS.



Rotatable stage

With an outer diameter of 142 mm, the stage rotates smoothly through 360° on a taper shank. Furthermore, it can be clamped at any position. The vernier calibration is 6′. Four holes are provided for fitting the stage clips. For the stage round clips two holes are deviced, and for the cross movement mechanical stage three holes are found on the surface of the stage.

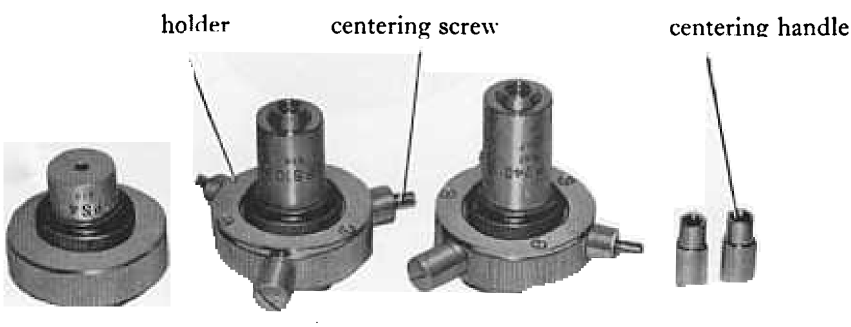


Objectives

Strain-free objectives are screwed firmly into holders.

Magnification of objectives	4x	10x	40x
Numerical aperture	0.10	0.25	0.65
Working distance (mm)	19.97	5.13	0.37

The 10x and 40x objectives have centering screws. These screws center the objectives at the rotational center of the stage. The centering screws are inserted from the right side of the tube. They are then turned 90° to the left.



Test Plates

The test plates comprise a 1/4 wave length plate (mica 147mμ) and tint plate (gypsum 530 mμ). These plates, which are used for checking the double refraction and distortion of the specimen and axial characteristics, are inserted in a slit on the right side of the tube.

tint plate

1/4 wave length plate

Analyzer

The analyzer can be slid out of the optical path, either to the right or to the left. Moreover, it rotates through 90° (1 div. = 5°) by means of a rotating lever. At 0°, the oscillation is latitudinal. In other words, at 0° the polarizer and analyzer are crossed Nicols.

Bertrand Lens

The Bertrand lens can be slid in and out of the optical path by means of the 90° rotatable handle attached to the middle part of the tube. When the lens is in the optical path, the mark on the handle points upward. In this case, the interference image, or conoscopic image, formed on the rear focal plane of the objective lens can be observed through the center of the eyepiece since the lenses have already been centered.

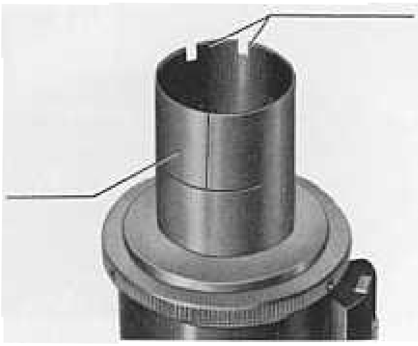
Registration Pin of Eyepiece Tube

Two insertion grooves for the registration pin are cut on the edge of the eyepiece tube, which measures 23.2mm in inner diameter. When the registration pin is inserted into the right-hand groove (A), the eyepiece cross-line agrees with the oscillation plane of the polarizer and analyzer when they are positioned at 0°; and when it is inserted into the other groove (B), the cross-line agrees with the diagonal position.

(B) (A)

insertion grooves for registration pin

eyepiece tube



Eyepieces

The flat 10x eyepiece is adjusted by means of a registration pin so that the cross-line agrees with the direction of oscillation. Visibility adjustments of the 10x eyepiece are made by means of helical movements.

Eyepiece magnification	Number of field of view
10x with cross-line and helical movement ring	13
7x with 0.1mm scale	18
5x	21

10x

7x

5x

CAUTION

Generally speaking, the POS should not be used where the temperature is higher than 50°c. Sudden changes in temperature or humidity produce moisture on the lenses and other parts of the microscope. This not only obscures vision but also causes corrosion.

2. The POS must be carried about with care since the slightest shock can impair the fine adjustment system.

3. The POS should be kept free of dust since dust, together with moisture, can cause molding. Dust on the optical system, especially the polarizer and analyzer, causes double refraction, which in turn dims contrast. The POS, therefore, should be covered with the vinyl dust cover immediately after use. If it is not used for some time, it should be kept in the case.

4. High temperature adversely affects the polarized plate of the polarizer and analyzer. Therefore, it should not be exposed over a long period to strong sunlight or illumination (more than 60°c).

5. Since the POS is a precision instrument, it should not be taken apart without adequate reason.

OBSERVATION METHODS

I. Standard

In principle, the polarizer, analyzer, test plate, and Bertrand lens should be slid out of the optical path since they are not required for ordinary microscopic examinations. In most cases, however, the polarizer is left in the optical path.

II. Orthoscopic Examination

Strictly speaking, in orthoscopic examinations, only light parallel to the optical axis of the microscope enters the field of view. In other words, only the parallel optical characteristics of the specimen can be examined through orthoscopy. Since, however, parallel light not only lacks brightness but also weakens the resolving power of the lenses, weak aperture lighting is almost always used by sliding the lower condenser lens into the optical path. For ideal results, weak aperture objectives as the 4x and 10x type should be used. In this case, better results can be obtained by adjusting the condenser iris to the aperture of the objectives. The centering screw can be used to rotate the specimen so that it will come in line with the center of the view field.

When the polarizer and analyser are clicked into position at 0°, the oscillation direction of each coincides with the cross-line of the eyepiece—lengthwise for the polarizer and widthwise for the analyzer. This condition is called crossed Nicols.

When the analyzer is left out, the condition is called single Nicol or one Nicol. By using both methods, the following characteristics can be examined: shape, size, and structure of the specimen, refraction, double refraction, interference color, extinction angle, optical azimuth and optical polychromism.

III. Conoscopic Examination

In conoscopic examinations, optical phenomena are studied by throwing light from all directions —with the exception of parallel light—on the specimen.

In other words, the specimen must be illuminated with circular beams. Therefore, the numerical aperture is increased by sliding the lower condenser lens out of the optical path; furthermore, large aperture 40x objective is used. By inserting a Bertrand lens after focusing on the specimen, an interference image, or conoscopic image, can be observed on the real focal plane of the objective lens. If a scaled eyepiece is used, the deflection of the interference fringe can be measured. The interference image can also be observed directly through the tube without the aid of the Bertrand lens and the objective lens.

PHOTOMICROGRAPHY

The Olympus PM-6 Small Size Photomicrographic Equipment is ideal for 35mm photomicrography.

I. For Orthoscope

First of all, the part of the specimen that is to be photographed is brought to the center of view field. Remove the eyepiece holder from the PM-6 and insert the desired eyepiece into the eyepiece holder. Re-place the eyepiece holder, with the desired eyepiece in it, to the PM-6, then mount the PM-6 on the microscope eyepiece tube. After adjusting the cross-line within the field of view by means of the viewer adjustment ring, the specimen is brought into focus by urning the fine adjustment handle. More detailed instructions on photomicrography are given in the PM-6 brochure.

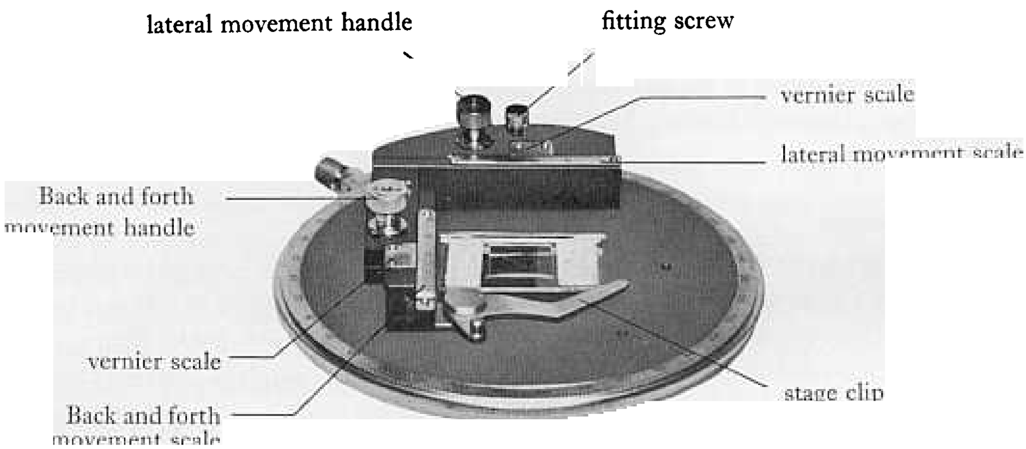
II. For Conoscope

First, produce a conoscopic image by sliding the lower condenser lens out of the optical path and by inserting a large aperture objective 40X and Bertrand lens according to instructions given in the section III on conoscopic examination. Next, remove the eyepiece holder from the PM-6 and insert the 10X eyepiece (with helical movement ring) into the eyepiece holder. Mount the eyepiece holder, with the 10X eyepiece in it, on the microscope eyepiece tube. Gently place (do not fix) the PM-6 on the eyepiece holder and hold it with one hand. The conoscopic image can be brought into focus by turning, with the other hand, the helical movement ring of the 10X eyepiece, while viewing through the viewer. Then screw the PM-6 onto the eyepiece holder, which in turn is screwed onto the microscope eyepiece tube. For focusing, follow the instructions given in the preceding section on orthoscopic photomicrography.

OPTIONAL ACCESSORLES

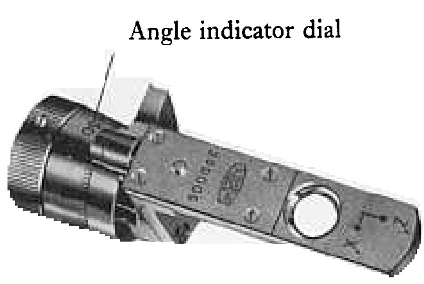
Cross Movement Stage

The cross movement stage is attached to the main rotatable stage. After the slide glass has been properly set, the observation point is moved lengthwise and widthwise until it coincides with the rotational center of the main stage. The cross movement range is 30mm, and the minimum vernier reading is 0.1 mm.



Berek Compensator

The Berek compensator contains laminated calciete in order to examine double refraction. Retardation is determined by checking the dial rotation angle against the correction table. First of all, the specimen is blotted out of vision by bringing the stage to a crossed Nicols position. The stage is rotated until the angle indicator dial registeres 45°; then the stage is clamped. Next, the test plate is inserted. The dial is turned until the zero interference color appears. Finally, the dial reading is checked against the correction table. If the order does not decrease, the entire process is repeated after rotating the specimen 90°. The test plate should be inserted or removed when the angle indicator dial registers 30° since at this angle the test plate is at right angles to the optical axis; in other words, retardation is zero. If the angle is overly sharp, the plate will come in contact with the insertion slit.



Olympus PM-6 Small-size Photomicrographic Equipment

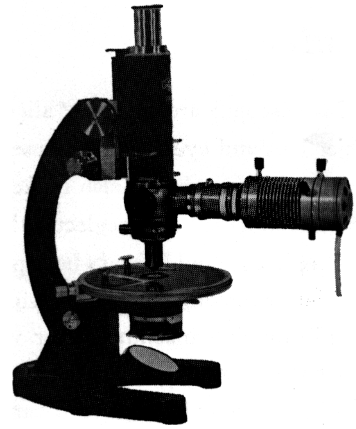
The Olympus PM-6 is a photomicrographic unit designed exclusively for 35mm photomicrography. It can be attached to biological and metallurgical microscopes, either of domestic make or of foreign make.

Shutter speed: B, 1—1/250sec.
Size of image: 24mm X 36mm
Specimen can be photographed during observation
Has insertion opening for photo cell of photomicrograhpic exposure meter.
Has smooth, stable shutter performance.
Magnification on the film plane is about 1/3x of microscope total magnifications

Opaque Illuminator Model LSP

The Olympus Model LSP is designed to use with Olympus Polarizing Microscopes Model POS and POM to perform the observation of an opaque specimen by polarized light.
Specifications:

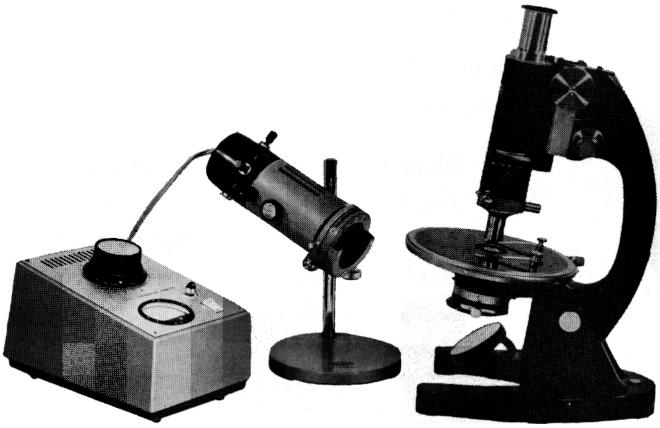
1. Opaque illuminator LSP
   Illuminator body
   Lamp bulbs: clear (6V, 2A)
   frosted (6V, 2A)
   Filters: Green (MGK)
   Yellow (MYK)
   Blue (MBS)
   Metal sliding plate
   Objectives: for mechanical tube length 200 mm
   MPO 6X
   MPO 10X
   MPO 40X
   MPO 100X
   Wooden cabinet



2. Transformer
   100V, 110V, 220V & 240V/A.C. available

Transparent Illuminator

1. Transparent Illuminator Model LSD with Transformer TE-II



2. Plug-in substage Simple Illuminator Model LSK-4

CAUTION

Microscopes are extrmely allergic to moisture. This is especially ture of such vital parts as objectives and eyepieces. These parts, therefore, should be kept in desiccator.

Microscopes should also be kept free of dust. Since dust tends to gather on the lens surface, stage, condenser and reglector,these parts should be regularly cleaned with a soft brush.

Eyepieces should always be capped when not in use. Special grease has been applied to the upper and lower moving parts of the coarse adjustment handle and condenser. Therefore, by all means, avoid applying machine oil or watch lubricating oil to these parts. Furthermore, microscopes must never be taken apart at random. Repair work should be left to specialists.

The lens may be cleaned if care is taken not to damage the surface. Either a clean bird feather or a blower should be used for removing dust from the inner part of objectives.

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PRINTED IN JAPAN 7304S10