INSTRUCTIONS
FOR
OLYMPUS POLARIZING MICROSCOPE MODEL PSM

The polarizing microscope is a useful instrument to study optical characteristics of materials by means of polarized light.

A standard microscope is used to observe shades and colors of a specimen by trans-illumination or vertical illumination.

The polarizing microscope further enables the user to observe the optical characteristics of the specimen and to recognize more detailed data. Therefore, even an extremely minute article may be made an object of the observation. In some cases, based on the optical characteristics thus obtained, even the chemical elements of the specimen can be conjectured.

For this reason, a polarizing microscope is widely utilized for the optical observation and research not only in the field of mineralogy and petrology, but also in chemistry, pharmacy, biology, medical science, and ceramics, as well as in chemical and textile industries.

The Olympus Polarizing Microscope Model PSM is with an inclined head. It is equipped with the excellent objective lenses at 4X to 100X magnifications and various attachments.
**CHARACTERISTICS**

1. Inclined head.
2. Quartz lantern lens. The entire optical system dust-proof.
3. Wide range of up and down movement of the stage. Universal rotatable stage attachable.
4. Extra accessories such as vertical illumination unit, and photometer- graphic equipment.
5. Connecting rod attachable for the synchronous movement of the polarizer and the analyser.
6. Wide field eyepieces.

**SPECIFICATIONS & FEATURES**

- **Magnification**: 20X-1,000X
- **Objectives**: Centering type
- **Tube**: 30° Inclination, iris diaphragm for the conoscopic observation, helicoid screw for adjustment of conoscopic image.
- **Range of Vertical Movement of the Stage**: 70mm, with minimum intervals of 0.005mm
- **Stage**: 16mm in diameter, rotatable through 360°w/000° variants with clamping mechanism.
- **Polarizer & Analyzer**: Polarizing filter of Eikohime made by Mitsubishi Electric Co.
- **Polarizer**: Rotatable through 360° with minimum intervals of 5°, click stop at 0° position.
- **Analyzer**: Rotatable by 90°, with minimum intervals of 5°, with a clamp.
- **Bertrand**: Centerable.
- **Test Plates**: 1/2 wave length retardation plate and tint plate of 500nm.

**SPECIAL ACCESSORIES**

1. Cross Movement Mechanical Stage
2. Berek Compensator with a compensation table
3. Eyepiece adapter
Objective
Rotating Stage

Base

yoke

Substage condenser dial.

Pulfrizer rotating dial.

Sweating-out knob

Iris Diaphragm lever

Vernier

Iris diaphragm
for comoscope obs.

Beck condenser centering knob

Centering knob for objective

Inserting & Rotating Lever for Analyser

Objective for objective

Objective for objective

Stage Cryostat

Stage plane

Clamp

Stage plate inserting window

Test plate inserting window

Fine adjust handle

Clamping lever for course adjustment

Course adjustment arm.

Objectives

Standard test plates

Eyepieces

Eye piece

Iris diaphragm
for comoscope obs.

Beck condenser centering knob

Centering knob for objective

Inserting & Rotating Lever for Analyser

Objective for objective

Objective for objective

Stage Cryostat

Stage plane

Clamp

Stage plate inserting window

Test plate inserting window

Fine adjust handle

Clamping lever for course adjustment

Course adjustment arm.

Objectives

Standard test plates

Eyepieces
1. Remove fixing screws and frames to take out the body from the cabinet.

2. Take the tube from the Attachment Container and set it onto the body. Turn the fixing ring till it no further goes.

3. Attach the condenser, the objective, and the eyepiece in the same order as in the case of a standard microscope.

4. Fix the reflector and clips.

5. Also included in the Attachment Container are a bottle of cedar oil and a filter. Use them as required during the observation.
CAUTIONS:

1. A sudden change in humidity and temperature causes moisture on the surface of the lens, resulting in the hazy effect during an observation. It further brings about mildews and corrosion. In general, a high temperature is not preferable.

2. Avoid giving a severe impact to the instrument. The very fine adjustment may be ruined. Be sure to carry the instrument carefully.

3. After its use, wipe off cedar oil at the tip of the objective with a piece of gauze soaked with xylenes; if anisidine is used, simply clean it with a piece of dry gauze. Any trace of oil left on the surface of the lens will cause an adverse effect on it.

4. Dust, along with humidity, will also cause an adverse effect and mildews on the lens. The instrument is dust-proof but an utmost precaution will never do a harm. Especially, dust accumulated in the optical path from the polarizer to the analyzer, will cause the hazy image resulting in a low contrast. After the use, therefore be sure to cover it with the elastic cover provided. If it is not to be used for a long time, return it to the cabinet.

5. The polarizing filter used for the polarizer and the analyzer will become inferior in its efficiency if exposed to the temperature over 60°C. It is risky to expose it to sunshine or to the strong illumination for a prolonged time.

6. A microscope is a very finely adjusted instrument. Refrain from disassembling the mechanical parts. Particularly the optical system requires a rigid and minute adjustment and, therefore, must absolutely be left to the specialist. In case of any necessity for repair, please contact our company or our agents.
Arm & Bed:
The arm which has been carefully designed considering the center of gravity while being carried, along with the stable bath, firmly holds the inclined head. Focusing is performed by up-and-down movement of the stage using of movement lemons, with fine adjustment intervals of 5μ. This fixed-head system ensures an accurate focus during prolonged observation and keeps the observer free of fatigue because of the fixed eyepoint. All operational parts are placed at the lower part of the microscope enabling the user an easy operation without changing the posture.

Mirror:
The foot of the reflecting mirror sits in the recopracla on the bed and can be turned to any direction. It can easily be removed by hand and replaced with the illuminator.

Condenser:
It moves vertically up and down by a rack and pinion. The top position is the optimum for the conoscopic observation. The top condenser lens swings out, i.e., it can be swung out or set back by the handle provided. The opening is 30° with the top lens and 60° without, suited for the conoscopic and orthoscopic observations respectively.

Pohotrope: Set in at the bottom of the condenser; rotatable through 360°, with minimum intervals of 5°, click stop at 0°; a color-temperature converting filter attachable.

Iris Diaphragm: The lever stop scale indicates the diameter of the diaphragm. The female screw head at the scale 180° of the polarized rotation indicator is used for the connecting rod for the synchronous movement of polarizer and the analyzer.
Circular Rotating Stage:

Outer diameter: 100mm; the stage plate outer diameter: 60mm, the inner diameter: 50mm; smooth rotation by means of ball bearings; with 360° scale and 1/20° verniers; may be clamped at any position; 4 holes for clip fitting; 3 holes for mechanical stage setting; 2 holes for universal stage setting; a ring provided at the bottom of the stage for the connecting rod for the analyzer and the polarizer.

Mechanical Stage Cross-movement:

The mechanical stage is attached to the rotating stage. Then a slide glass is set onto it and the position of the specimen to be examined is aligned with the center of the rotating stage. The maximum range of movement, in four directions—back & forth and left & right, is 38mm each and readings may be obtained as small as 0.1mm on verniers. In such a case as the observation of ores by the vertical illumination, first fix the specimen on the slide glass by rubber, etc., and set the glass onto the mechanical stage. The handpress for the metallurgical microscope can be used to prepare a specimen.
Iris Diaphragm:
When the Bertrand lens is inserted, the specimen forms its image at the vicinity of the iris diaphragm in the middle of the head. When an observer's interest is centered at a certain portion of the specimen, this diaphragm is used to cover up the unnecessary portions.

Iris Diaphragm:

When the objective is pulled out to the fullest, the analyzer is set in the optical path. It can be rotated through 90° as illustrated. The analyzer is usually kept in the optical path during the observation, except for a standard observation.

When the lever is pulled in as illustrated, the analyzer will not work, and this is the position used for a normal observation.
Tube Length Adjustment Ring:

By means of a helicoid screw inside the adjustment ring, the tube length will be adjusted from 100mm (position 0) to 107mm (position 5). For an orthoscopic observation, use position 0. For a conoscopic observation, use position 5. For a conoscopic observation, the position of the interferential image will be different according to the objective used and, therefore, the tube length must be adjusted accordingly to obtain the clearest conoscopic image.

The most preferable tube lengths according to each objective are as follows:

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>P025X</th>
<th>P040X</th>
<th>P0150X</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUBE LENGTH (Position)</td>
<td>4.5-5.0</td>
<td>4-4.5</td>
<td>0.7-1.0</td>
</tr>
</tbody>
</table>

Registration Pin:

Two slots for the registration pin are cut on the eyepiece tube of 9mm inner diameter. Facing from the observer, if the registration pin is inserted in the righthand side slot, the cross line in the eyepiece will align with the vibrating direction of the analyzer position 0 and the parallage position 5. If it is inserted into the other slot, the cross line will align diagonally.
Excellent strain-free lenses carefully screened are encased in a holder indicating the magnification.

<table>
<thead>
<tr>
<th>MAGNIFICATIONS</th>
<th>4X</th>
<th>10X</th>
<th>30X</th>
<th>40X</th>
<th>100X</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMERICAL APERTURES</td>
<td>0.1</td>
<td>0.25</td>
<td>0.40</td>
<td>0.65</td>
<td>1.30</td>
</tr>
<tr>
<td>WORKING DISTANCES</td>
<td>30.0</td>
<td>5.8</td>
<td>1.55</td>
<td>0.56</td>
<td>0.14mm</td>
</tr>
</tbody>
</table>

On each holder is attached a centering knob. Insert the objective from the right-hand side of the tube and turn 90° to the left.

Eyepieces:

PW10x

PW7x

PW5x

The wire line in each wide-field eyepiece can be aligned with the direction of the vibration by the registration pin. The eyepiece can be heightened or lowered by the helicoid screw to adjust the eye sight.

<table>
<thead>
<tr>
<th>VIEW FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW5X 25.0 With crossline</td>
</tr>
<tr>
<td>PW7X 34.0 0.1mm scale</td>
</tr>
<tr>
<td>PW10X 30.0 With crossline</td>
</tr>
</tbody>
</table>

The pin-hole cap, a special attachment, can be used, replacing an eyepiece, for a general observation of the interferential image without the help of the Bertrand lens.
**BODY**

**Test Plates:**

Insert the 1/4 wavelength retardation plate (mica 147 μm) or the Vog plate (gypsum 535 μm) into the provided window at an angle of 45°. They are used for examination of the birefringence or warps and for determination of the axis.

**SPECIAL ACCESSORIES:**

Berek Compensator

A piece of calcite is set in this compensator to measure the birefringence of the specimen. The compensator is inserted into the test plate window. Readings taken from the angle indicator dial combined with the data taken from the attached compensation curve table will determine the retardation.

A birefringent specimen may be at the extinct position stage 45° by the scale and clamp it at the diagonal position. Then insert the compensator, turn the dial until the differential color in zero order appears in the center of the field. Take the reading of the angle. Compare it on the compensation curve and obtain the closest value of the retardation. If the order doesn’t lessen even by turning the compensation dial, turn the specimen 90° and repeat the same procedure.

At the position of 30° on the indicator dial, the test plate will become perpendicular to the optical axis with 0 retardation; therefore, insertion and removal of the test plate is performed at this position. If it is overly shocked it will get stuck at the inserting window.

**Eyepiece Adaptor.**

If the observer prefers to use an eyepiece of a standard microscope with a smaller 186 diameter, he may remove the PMG eyepiece and replace with this adapter. Then the normal eyepiece may be inserted in it. This will make possible the use of the general eyepieces, graticule measuring eyepieces, or other specialized eyepieces.
Observation Methods:

Standard:
When the instrument is to be used as a standard microscope, the polarizer, test plate, and the Bertrand lens are not necessary. In principle these are to be removed from the optical path, but ordinarily the polarizer is left in operation.

Orthoscopic:
With the microscope properly set for this type of observation, only the light passing in almost parallel to the optical axis will enter the view field, thus enabling the user to observe the optical characteristics of the specimen in that direction.

In principle the parallel light source is to be applied, but since this will glaring the field and lower the resolving power of the lens excessively, it may be illuminated by allowing the low aperture at the lower condenser lens only swinging out the top lens. Therefore, mostly the low magnification objectives of 20X, or under, are utilized. It is recommended to adjust the contrast by means of the aperture diaphragm at the bottom of the condenser in accordance with the objective used.

The centering knob on the objective fixing ring can be utilized to align the center of the specimen with that of the view field.

Consopic:
It is necessary to illuminate the specimen by core lighting. Put the top condenser lens back into the position, then attach a high magnification objective, such as 40X or 100X. After appropriate focusing on the specimen, insert the Bertrand lens and now focus on the interferential fringe formed at the back focusing plane of the objective (better known as the conoscopic image by helical movement of the tube. Also a pin-hole cap may be used in place of an eyepiece to directly observe the interferential image mentioned above. In this case the Bertrand lens is moved out of the position.

If only a portion of the specimen is of interest to the observer, he must first remove the Bertrand lens, align the center of the stage with that of the view field, then place the specimen at that center and trim the field to the desired portion by operating the iris diaphragm. Put the Bertrand lens back into the position, obtain its center by the centering knobs provided, and align it with the center of the ocular field. Now it is ready for observation of the deviation of the interferential fringe or its measurement by a scaled eyepiece.
* オリンパスの生物レンズには色帯が入っています。

光学、および光学の生物レンズには、色帯が入っています。

これは、生物レンズに表示されている倍率、色帯を見ると、このレンズを用いれば、色帯がわかるように着色しやすいように設計したもののです。

強制的に着色し、色素の試験をするリーダーがあるが、現点以下で、この色帯は入れてよいので、使う上、有用に活用して、さい。

* OLYMPUS OBJECTIVE HAS ITS COLOUR BAND

THE OLYMPUS OBJECTIVE, you just purchased, has a colour band on it. This new ray has been adopted for your convenience, that you may understand the magnification, if you only see the colour, without looking at the magnification number engraved on the tube. Though there is no mention about the colour band in the instruction booklet, upon your perusal of our new colour system, the Olypsum product is sure to display your correct usage of the Olypsum product.