PriorLux POL™

PRIOR
Scientific

Advanced Polarising Microscope

Operating Instructions

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1. Introduction

The PriorLux POL upright compound polarised light microscope is a high quality instrument equipped with high resolution, chromatically corrected strain-free optics for excellent image quality in polarised light applications. The robust construction and hard wearing materials ensure long lasting and trouble free operation. The instrument can be used with a number of supplied accessories including ¼ and compensation plates, quartz wedge, attachable mechanical XY stage and eyepiece graticule with stage micrometer.

For documentation the instrument is available with a trinocular head which permits mounting of a video or digital camera system.

2. Unpacking

The PriorLux POL is shipped in protective bags within a pre-formed container. Each component should be carefully unpacked and checked, cutting rather than tearing the plastic bags. The head (binocular or trinocular) should be fitted to the dovetail on top of the stand and locked in place with the head locking screw. The eyepieces then just drop into the eyepiece tubes at the front of the head, these should be pushed in as far as they will go.

Remove each objective lens from its protective "pot" and screw into the free positions on the nosepiece. Move the stage and the condenser carrier to the highest position and insert the condenser from underneath with the diaphragm control facing to the front. This is locked in position with the clamping screw, which is fitted from the side.

3. Specifications

Eyepieces	10x 20mm field of view		
Condenser	Abbe NA 1.25 with iris diaphragm and filter holder		
Mechanical Stage	360 Degree rotation, 1 degree increments		
Focusing Mechanism	Co-axial fine and coarse adjustment with tension control and focus stop		
Viewing Head	Interpupillary distance 55-75mm		
Kohler Illumination	12V 30W halogen lamp with variable brightness control		
Power Supply	220/240 VAC 50/60Hz or 110/120 VAC 50/60Hz.		
Objectives	Mag.	NA	Tube Length
	4x	0.12	∞
	10x	0.25	∞
	20x	0.45	∞
	40x (S)	0.65	∞
	60x (S)	0.85	∞

4. Component Parts

5. Electrical Connection and Safety

Stands are supplied with an operating voltage of either 220/240 VAC 50/60Hz or 110/120 VAC 50/60Hz. The instrument is supplied with a power lead complete with appropriate plug for mains connection. UK plugs are fitted with a 3A fuse. This should only be replaced with a similarly rated fuse. The instrument should ALWAYS be switched off and isolated from the mains before any lamp or fuse is changed. The internal fuse is a T1.25A type (replacement code W335). If necessary, replace only with this type of fuse.

6. Setting Up

Connect the power cable to the base of the microscope, at the rear, and before switching on the power, reduce the lamp intensity control to its minimum setting. After switching on, the intensity should be increased to a comfortable level. This procedure should be reversed before switching off. Following this method will considerably prolong the life of the bulb.

Binocular/Trinocular Head

Interpupiliary distance should be set by rotating both eyepiece tubes in an arc until the two images coincide and the view is perfectly circular to both eyes. Note the value on the scale between the eyepieces so that the position can quickly be regained for future viewing. Place a specimen on the stage and focus the image while looking through only the right eyepiece. When the specimen is in focus close the right eye and adjust the dioptre on the left eyepiece so that the image is perfectly focused. The instrument is now balanced for your eyes.

7. Setting Köhler Illumination

A. Follow the procedure in section 6 to set up the instrument for your eyesight.

B. With a specimen in sharp focus and the analyser in the "out" position using the 10x objective, close the field diaphragm until it impinges on the field of view, Figure 1, Picture A.

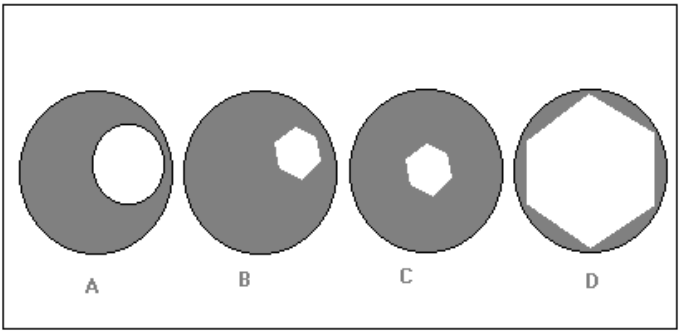


Figure 1

C. Focus the condenser using the side mounted rack and pinion controls until the leaves of the diaphragm are in sharp focus, Figure 1, Picture B.

D. Using the condenser centration controls move the diaphragm into the centre of the field of view, it may help to open it until it is nearly touching the outside of the field to attain perfect centration, Figure 1, Pictures C & D.

E. Fully open the field diaphragm.

F. Fully open the condenser diaphragm and then slowly close it until you see the contrast within the image increase. If you then remove an eyepiece and look directly down the tube from a distance of 20-30cm you should see an image similar to picture D in Figure 1. The aim here is to have the "bright" area occupying approximately 70% of the total field. The amount it occupies will change dependant on the objective lens in use. If you have set up the instrument using the 10x objective (recommended) then as you increase the magnification this diaphragm will need opening to optimise the contrast and resolution. Often it is set for the objective which is either most frequently used or most critical in terms of resolution and left in that position

8. Cleaning Objectives

It is critical that the front lens of each objective is kept clean and free of contamination. Any dust or dried immersion oil will seriously affect the image quality attainable with that objective. If contamination is suspected then the easiest way to confirm this is by removing the objective lens and examining the front lens using the eyepiece. To do this take out one of the eyepieces, turn it around so that you are looking the wrong way through it and move it towards the front of the objective until you can focus on the front lens. This will clearly show any contamination. To remove dirt and oil a lens cloth, lens tissue or cotton bud dampened with industrial alcohol can be used. A spiral motion starting from the centre of the lens moving to the outside is the best way of achieving a thoroughly clean surface

9. Centring the Objectives

The lowest power objective is mounted in a fixed position and therefore centration of this particular lens is not user adjustable.

All other powers are mounted in positions with adjustment screws fitted into the nosepiece above to enable the end user to make adjustments to the alignment of the objective lens. To re-align an objective which is obviously misaligned with the centre of rotation, as indicated by the crossline in the eyepiece the following procedure should be followed.

Insert the two supplied centring keys into the adjustment screw sockets above the objective in the knurled ring of the nosepiece. Rotate the stage and observe that part of the specimen upon which the specimen appears to rotate. If necessary move the specimen until the centre of rotation coincides with a feature in the specimen that is easily recognised.

Now by means of the centring screws move the feature until it coincides with the intersection of the crossline in the eyepiece. The stage must remain stationary while the objective is being centred. Once the identifiable feature has been aligned with the crossline rotate the stage to check that the axis of rotation is now coincident with the intersection of the crossline.

10. Attaching the Mechanical XY Stage

The attachable mechanical stage enables smooth specimen movement along with precise re-positioning courtesy of the vernier scales.

Firstly remove the sprung stage clips and retain for future use. The mechanical stage then simply screws into the tapped hole provided in the top plate of the stage.

11. Observations Between Crossed Polars

Before using crossed polars, always remove the specimen from the stage and check that extinction is complete when the analyser is "in". Both polariser (below the sub-stage condenser) and analyser (underneath the viewing head) are rotating. It is recommended that the polariser is set to the reference position and then the analyser rotated so that it is at ninety degrees to it. At this point extinction will be achieved.

12. Conoscopic Observation

A microscope is used conoscopically when the back focal plane of the objective is observed using the Bertrand lens. In petrology birefringent specimens can produce interference patterns in this plane that are of considerable importance. The figures can be either uniaxial or biaxial, and can only be properly observed when objectives of high aperture are used and the full aperture of the condenser is utilised, that is, with the upper lens in position and the iris diaphragm opened to the full. The front lens of the condenser should be as close to the specimen as possible. A uniaxial crystal gives a characteristic "ring and brush" whilst a biaxial crystal gives a figure with two "eyes" or metalopes, which rotate as the specimen rotates. The complete symmetrical figure is only obtained when the section is perpendicular to the acute bisectrix of the optic axes of the crystal. The angle between the optic axes of a biaxial crystal can be calculated by the method due to Mallard. Measurements between the metalopes can be calibrated against the figure obtained from a known crystal such as quartz.

13. Bertrand Lens

The Bertrand lens is built into the microscope and enables the user to switch quickly between orthoscopic (Bertrand lens out) and conoscopic (Bertrand lens in).

14. Use of Compensators

The slot in the body of the microscope between the nosepiece and the viewing head of the microscope, set at 45° to the N-S axis is for the insertion of the supplied compensators. These should be inserted when the colour of the specimen is at its maximum, that is, when it is turned 45° from the position of extinction. Compensators provided for use with the PriorLux POL are DIN standard.

Quartz Wedge

When a wedge of uniaxial crystal of quartz, cut parallel to the optic axis is inserted into the compensator slot between crossed polars a series of interference colours will be observed. The retardation caused by the specimen can be assessed by its compensation of an order of colour of the wedge. The Prior quartz wedges are mounted length "fast" and when the interference colour of a mineral specimen is compensated by placing the slow of the wedge on the fast of the specimen, the position of the colour in Newton's scale can be ascertained. The quartz wedge is wedge is used when the birefringence specimen and the interference colours are high.

Sensitive Tint Plate

The type of compensator is often also referred to as a first order red compensator. It is cut to give an interference colour at a very sensitive part of the colour scale. When inserted between crossed polars the fast and slow direction of a birefringent material can be determined. The specimen is rotated until the colour order is raised or lowered by the maximum amount. If the colour raised, the fast direction is coincident with the fast direction of the sensitive tint plate.

Quarter Wave Plate

This compensator gives retardation of ¼ wavelength between the vibration directions. When the specimen is rotated, with the quarter wave plate inserted between crossed polars the fast and slow directions of the specimen can be found by the rise and fall of the order of colour. A maximum rise of colour will occur when the fast direction of the quarter wave plate coincides with the fast direction of the specimen.

15. Using a Camera

The PriorLab / PriorLux microscopes, when fitted with a trinocular head, can be used with a range of cameras for documentation purposes. Video cameras, both analogue and digital provide 'moving' pictures for more advanced imaging applications, while digital 'still' cameras can be used for basic image capture.

Detailed instructions for the operation of the selected video or digital camera are supplied with the camera.

Assembly Video Cameras

A. Screw the c-mount adapter (part no. WXCM1 1.0x or WXCM050 0.5x) to the video camera

B. Loosen the knurled silver screw on the c-mount adapter and insert the adapter with the attached camera into the top of the photo tube on the trinocular head

C. Tighten the screw to secure the assembly

D. Connect camera to a PC, framegrabber or analogue monitor as required

E. To view the image via the camera, pull out the light path selector on the side of the trinocular head. This diverts 80% of the light to the camera and 20% to the eyepieces

Assembly Digital Cameras

This is similar to the assembly of video cameras above, but a digital coupler (part no. MZO1403 suitable for the Nikon Coolpix 4500 or the MZO5503 suitable for the Nikon Coolpix 5400) and a step down ring (part no. W3000) may also be required depending on the camera model used.

For more detailed set up information refer to the literature supplied with the camera.


Digital Camera
Step Down Adapter
Digital Coupler
1.0x C-Mount

16. Bulb Replacement and Adjustment

Halogen bulbs have a finite life and will need replacing from time to time. Replacement bulbs, part number W3257, are available from Prior Scientific.

To change the bulb;

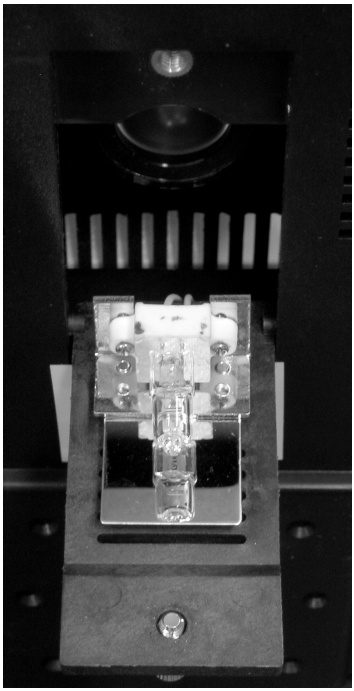
A. Switch off the microscope and isolate from the mains electrical supply

B. Remove the eyepieces from the viewing head to prevent them falling out

C. Lay the microscope on its back to gain access to the base plate

D. Loosen the screw which holds the lamp cover to the base plate

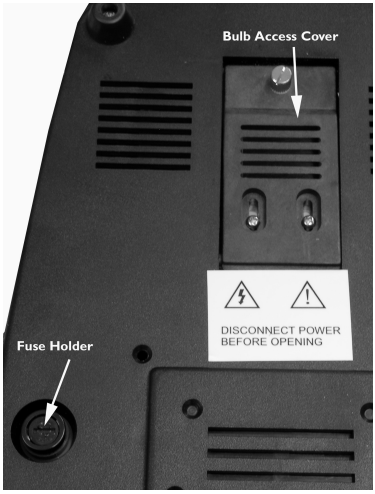
E. Open the lamp cover to expose the bulb holder



F. Remove the old bulb and replace it with the correct replacement bulb (part no. W3257, 12V 30W push fit double pin type) by sliding upwards in its holder. Do not handle the bulb with bare fingers, hold it in a piece of paper tissue or in the bulb wrapping material. Finger marks can cause contamination which blackens the bulb when it is switched on. If the bulb has been touched with the fingers, clean it with a tissue moistened with alcohol.

17. Fuse Location

The fuse is located on the base towards the front right corner of the instrument.



18. Spare Parts

W3257 – Spare bulb 12V 30W Halogen

W335 – Fuse T1.25A

19. Safety Precautions

The following symbols have been used on this microscope

These symbols are found next to the bulb access door on the underside of the instrument.

Warning High voltage, disconnect power supply before changing the bulb.

This symbol is located next to the bulb access door on the underside of the instrument

Caution Hot surface, allow surface and bulb to cool down completely before attempting to change the bulb.

20. Regulatory Compliance

Complies to the following standards

EN/IEC 61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use – part 1: General requirements

EN61326:1997 (+A1/A2/A3) Electrical equipment for measurement, control and laboratory use – EMC requirements

Class B emmisions

EN61326:1997 (+A1/A2/A3) Electrical equipment for measurement, control and laboratory use – EMC requirements

General immunity

CFR 47 : 2004 class A Code of federal regulations pt 15subpart B – Radio frequency devices – unintentional radiators

CERTIFICATE NO: FM 61600
STANDARD: BS EN ISO 9001:2000

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