Polarizing Microscope

BA310 POL

Instructions

We are constantly endeavouring to improve our instruments and to adapt them to the requirements of modern research techniques and testing methods. This involves modification to the mechanical structure and optical design of our instruments.

Therefore, all descriptions and illustrations in this instruction manual, including all specifications are subject to change without notice.

Although every effort has been made to ensure the accuracy of this instruction manual, if you note any points that are unclear or inaccurate, please contact **Motic agency or our Technical Service directly.**

Introduction

The polarizing microscope, or the petographic microscope, as it may be called, is used to the exclusion of models in the study of thin sections of minerals and rocks. The optical system is similar to that of the modern compound microscope.

The polarizing microscope however, contains several additional features, which greatly increase its range of usefulness. The most distinctive features are the graduated circular rotating stage, the polarizer and analyzer. Additionally, accessories such as the Bertrand lens, mica plate, gypsum plate and quartz wedge permit the evaluation of properties and characteristics that cannot be measured by other means.

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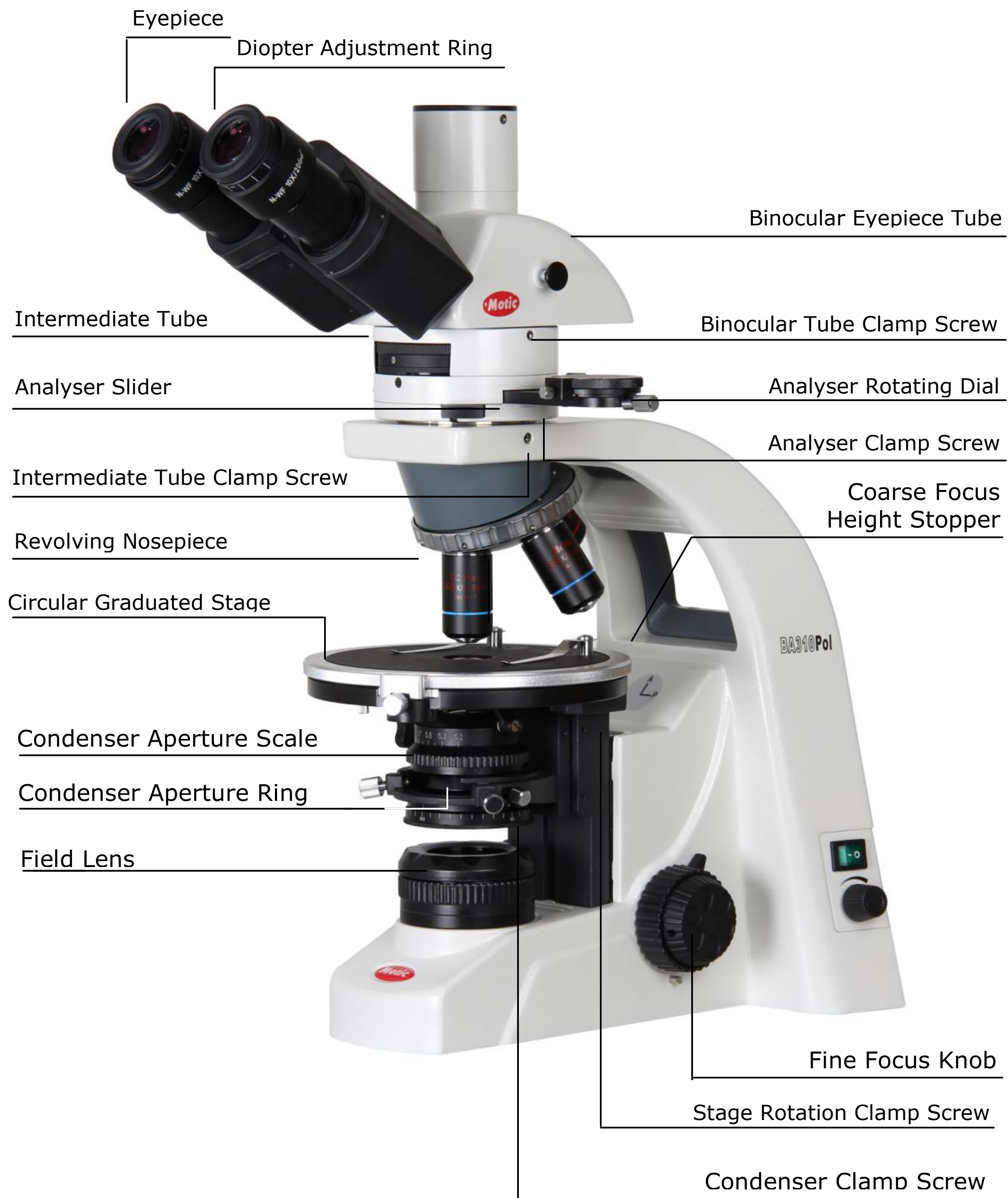
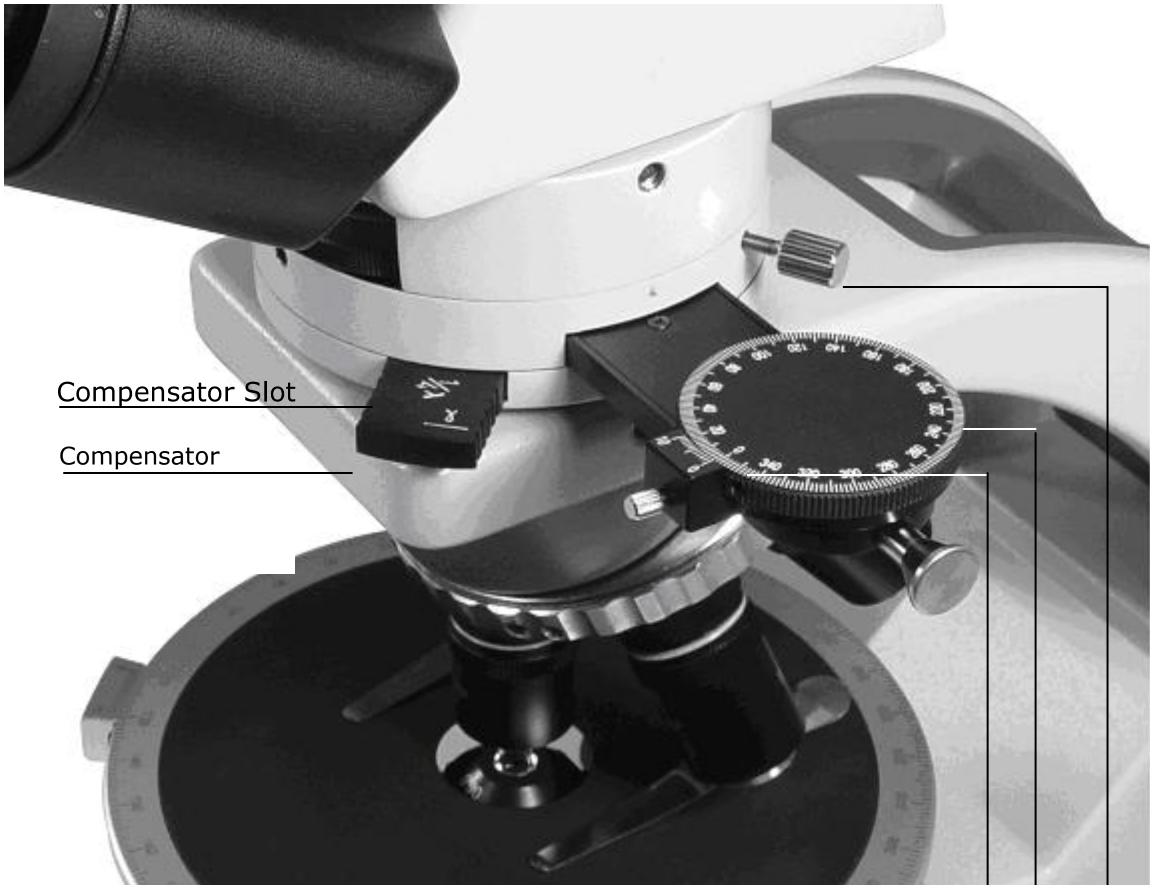
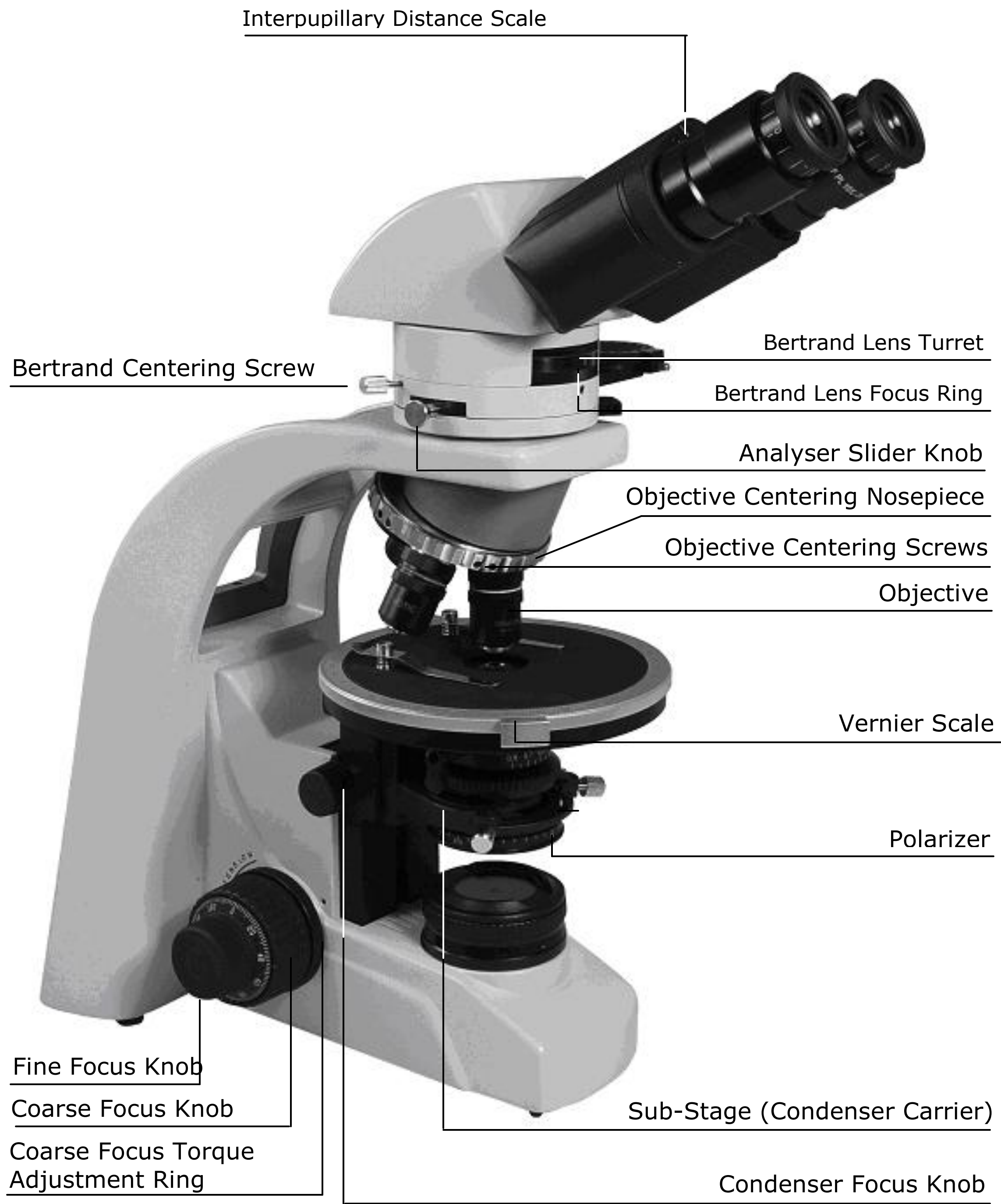
1 Nomenclature

BA310 POL





Intermediate Tube



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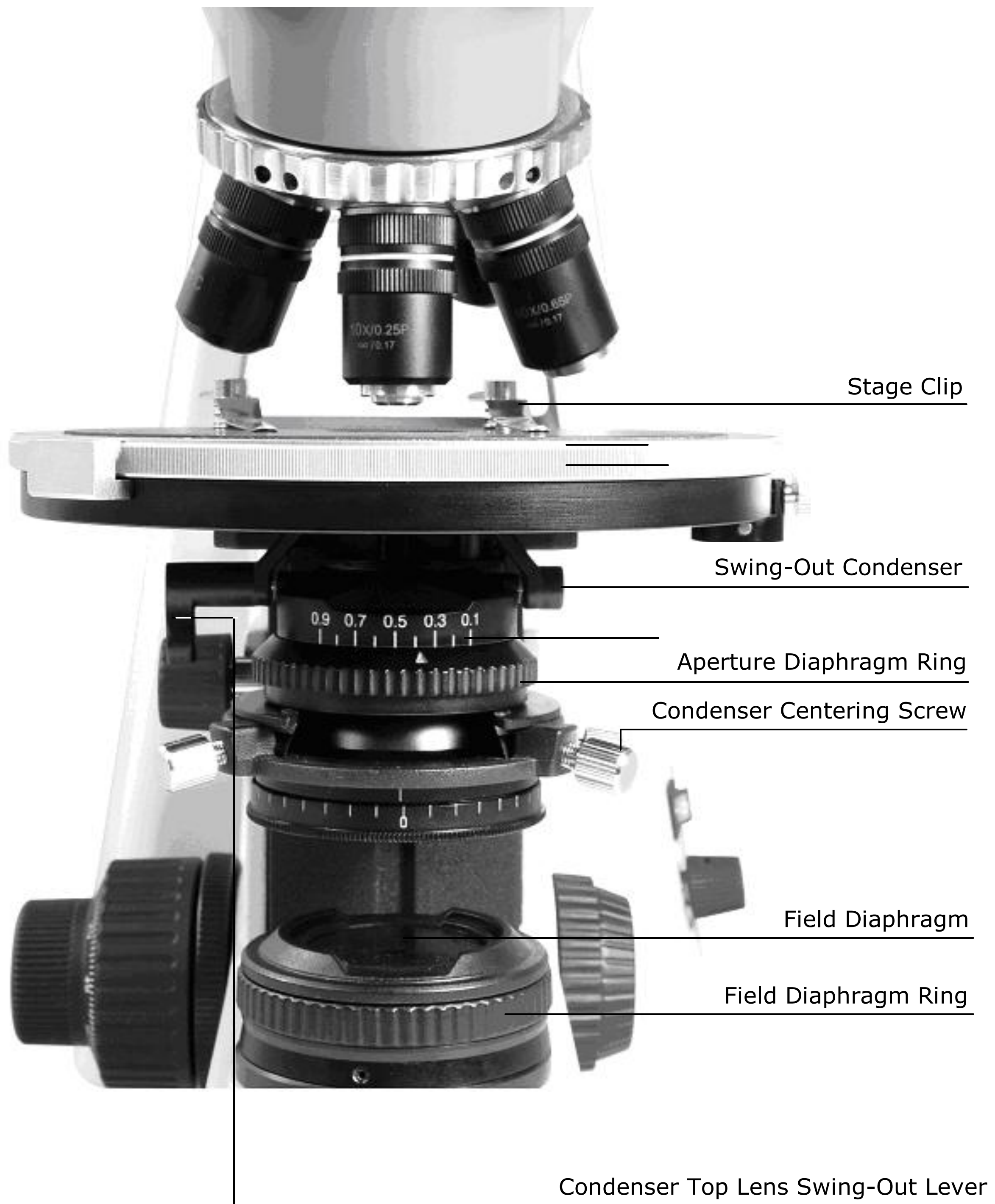
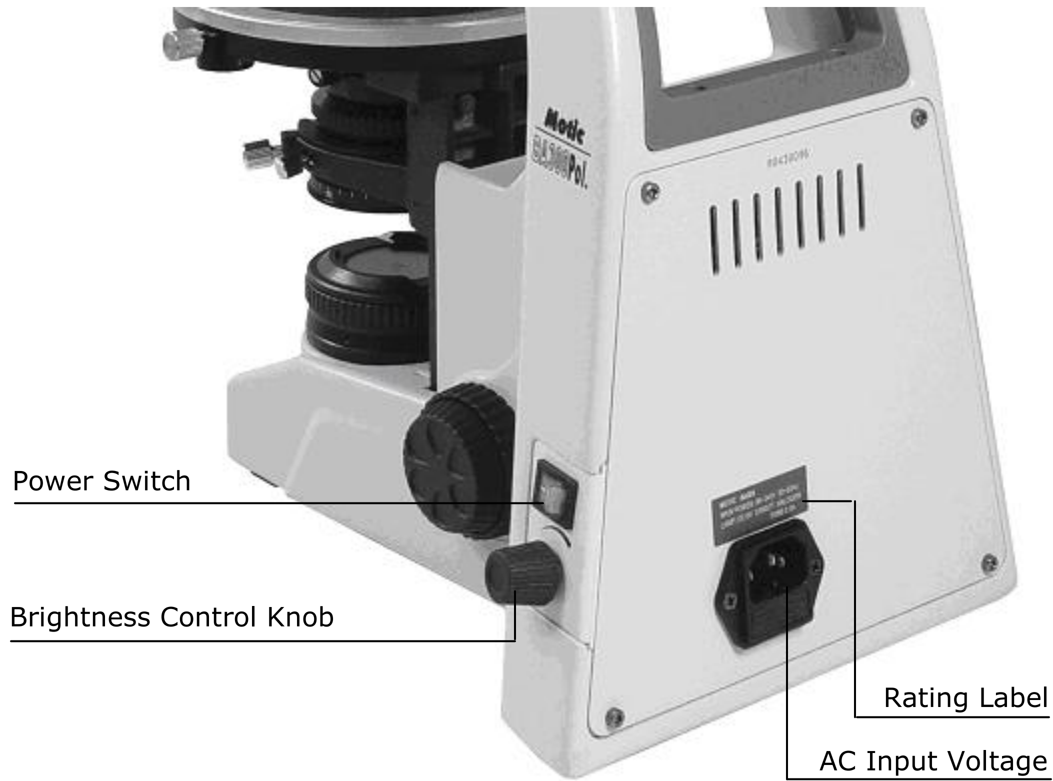

Stage Clip
Swing-Out Condenser
0.9 0.7 0.5 0.3 0.1
Aperture Diaphragm Ring
Condenser Centering Screw
Field Diaphragm
Field Diaphragm Ring
Condenser Top Lens Swing-Out Lever

2 Setting up the Instrument

Avoid placing the instrument in locations exposed to direct sunlight, dust, vibration, high temperature and high humidity

3 Assembling the Microscope



3.1 Input Voltage

- The automatic voltage selection works with a broad range of settings. However, always use a power cord that is rated for the voltage used in your area and that has been approved to meet local safety standards. Using the wrong power cord could cause fire or equipment damage.
- When using an extension cord, only use a power supply cord with a protective earth (PE) wire.
- In order to prevent electric shock, always turn the switch on the power supply **off** before connecting the power cord.

3.2 Lamp and Lamp Cover (Replacing the Lamp)

- In order to prevent electric shock always turn the power switch off and unplug the power cord before installing or replacing the lamp.
- Place the microscope on its back and pull back the lamp cover plate.
- Firmly insert the lamp into the socket pinholes until it reaches the limit. Be careful not to tilt the lamp when mounting.
- When installing the lamp, do not touch the glass surface of the lamp with bare fingers. Doing so will cause fingerprints, grease, etc., to burn onto the lamp surface, reducing the illumination provided by the lamp. If the surface is contaminated, wipe it clean using lens tissue.
- Close lamp cover plate and secure until it snaps into position.

3.3 Halogen Lamp

- Tungsten-halogen lamps operate at very high temperatures and may cause serious burn injuries if handled while hot.
- When replacing these lamps, always allow them to cool before removing them from the lamp socket.
- Avoid handing the bulb envelope directly because fingerprints left on the envelope will be burned into the glass, often initiating premature lamp failure.
- Manufacturers package tungsten-halogen lamps in protective plastic bags to avoid handling problems.
- Use a pair of scissors to cut the bag near the tungsten pins, insert the lamp into its holder while it still remains in the bag.
- Remove the bag, when the lamp is properly positioned in the lamp socket.

3.4 Specimen Clip

- Insert two specimen clips into the holes on the circular graduated stage surface

3.5 Attachable Mechanical Stage (Optional)

- Mount the attachable mechanical stage onto the circular graduated stage, inserting the two positioning pins at the bottom of the attachable mechanical stage into the pinholes on the stage surface.
- Tighten the clamp screw.

3.6 Objectives

- Lower the stage completely.
- Screw the objectives into the revolving nosepiece starting with the reference position so that clockwise rotation of the nosepiece brings the next higher magnification objective into position.

  Note: The BA310 Polarizing microscope allows you to center three objective positions with a reference objective

3.7 Condenser

- Raise the stage by turning the coarse focus knob.
- Lower the sub-stage (condenser carrier) by turning the condenser focus knob.
- Insert the dovetail mount with aperture scale facing the front.
- Secure with condenser clamp screw.
- Turn the condenser focus knob to raise the condenser as far as it will go.

3.8 Intermediate Tube

- Loosen the intermediate tube clamp screw on the microscope arm. Insert the round dovetail mount of the intermediate tube into the round dovetail mount on the microscope arm by tilting it at an angle. When fitting, insert the positioning pin on the underside of the intermediate tube in the receiving groove on the arm.
- Secure in position with clamp screw.

> Given that the intermediate tube contains a built-in depolarizer, it is not necessary to be concerned with the relationship between the plane-polarized beam and photomicrographic devices. (See Microscope Terminology)

3.9 Analyser Slider

- Unscrew the analyser slider knob from the side of the slider. Insert into the slot of the intermediate tube with the analyser-rotating dial positioned on the right of the intermediate tube. Secure with slider knob.

3.10 Compensators

- Insert the compensator into the compensator slot of the intermediate tube.
- The compensator slot is oriented so that accessory plates are inserted at 45º to the cross-lines.

3.11 Eyepiece Tube

- Loosen the eyepiece tube clamp screw. Insert the round dovetail mount of the eyepiece tube into the round dovetail mount on the intermediate tube by tilting it at an angle. When fitting, insert the positioning pin on the underside of the eyepiece tube in the receiving groove of the intermediate tube.
- Secure the eyepiece tube in position with the clamp screw.

  Note: The binocular tube is designed to prevent a cross-line slant that can be caused by adjusting the interpupillary distance. In addition, the direction of polarizing light oscillation can be precisely aligned.

3.12 Eyepieces

- Use the same magnification eyepieces for both the right and left eyes.
- Place the eyepieces into the sleeves of the binocular tube.
- The sleeve of the right eyepiece tube has positioning slots for either 90° and 45° orientation
- Install the right eyepiece by aligning the positioning pin of the eyepiece with positioning slot of the eyepiece sleeve.
- Slide the rubber eyecup onto the grove around each of the eyepieces.

3.13 Filters

- Place the filter in the filter holder located around the field lens, taking care that dust, dirt and fingerprints do not get on the filter and the field lens.

  Filter selection:

Filter	Function
ND2 (T=50%)	For brightness adjustment in photomicrography
ND4 (T=25%)	
ND16(T=6%)	
Blue Filter (Colour Balancing Filter)	For routine microscopy and photomicrography
Green Interference (546nm)	For retardation measurement and contrast adjustment

- A diffuser is built into the base of the microscope. When removing the diffuser from the light path, turn the diffuser engage/disengage screw as far as it will go in the clockwise direction with a hex screwdriver. When returning it to the light path, turn the screw in counter-clockwise direction.

3.14 Power Cord

- Connect the socket of the of the power cord to the AC inlet on the rear of the microscope. Plug in the other end of the cord to an AC outlet with ground conductor.

4 Microscopy

Manipulation of Each Component

4.1 Coarse and Fine Focusing

- Focusing is carried out with the coarse and fine focus knobs at the left and right of the microscope stand.
- The direction of vertical movement of the stage corresponds to the turning direction of the focus knobs.
- One rotation of the fine focus knob moves the stage 0.2mm. The graduation on the fine focus knob is 2 microns.

> Never attempt either of the following actions, since doing so will damage the focusing mechanism:
>
> Rotate the left and right knob while holding the other.
> Turning the coarse and fine focus knobs further than their limit.

I. Coarse Focus Torque Adjustment

- To increase the torque, turn the torque adjustment ring located behind the left-hand coarse focus knob in the direction indicated by the arrow. To reduce the torque, turn the ring in the direction opposite to that indicated by the arrow.

II. Coarse Focus Height Stopper

- The coarse focus height stopper marks the stage position at which the specimen is in focus i.e. by restricting the movement of the coarse focus knob.
- With the specimen in focus, turn the coarse focus stopper knurled screw clockwise until it reaches the stop.
- When the coarse focus stopper is in position, the stage cannot be raised from that position. However, the fine focus knob can move the stage regardless of the limit but will only lower the stage.
- Lower the stage by using the coarse focus knob.

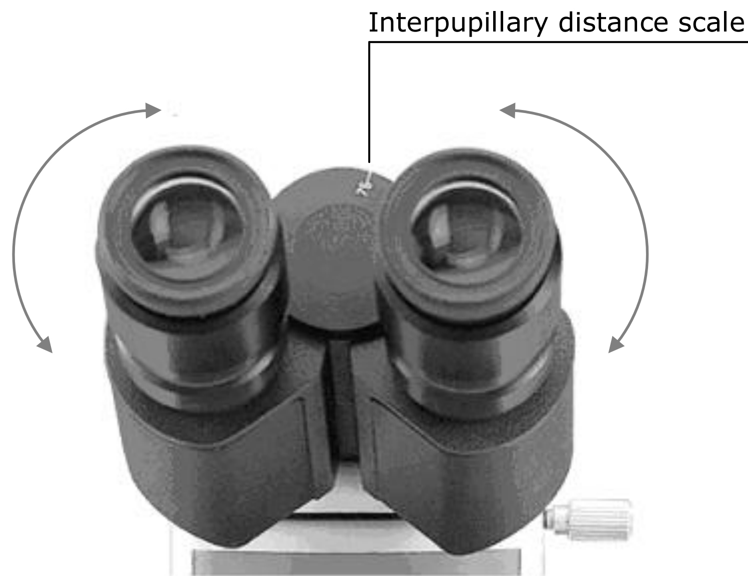
4.2. Binocular Tube

I. Diopter Adjustment

- Diopter adjustment compensates for differences in vision between the left and right eyes. In addition to making observation through both eyes easier, this adjustment also reduces the extent to which focusing is lost when the objective magnification is changed. In particular, this occurs when a low magnification objective is used.
- In the case of a polarizing microscope, an eyepiece containing cross-line is used for the right eye; the procedure for adjusting the diopter differs from that of an ordinary microscope.
- Turn the diopter adjustment ring on the right eyepiece to bring the cross-line in the eyepiece into focus.
- Next, focus on a specimen while viewing with the right eye, and then turn the diopter adjustment ring on the left eyepiece and bring specimen into focus.

II. Interpupillary Distance Adjustment

- Before adjusting the interpupillary distance, bring a specimen into focus using the 10x objective.
- Adjust the interpupillary distance so that both the right and left field of view become one.
- This adjustment will enable the user to observe the specimen with both eyes



4.3 Condenser

I. Focusing and Centering

- Fully open the field of view diaphragm and condenser aperture diaphragm.
- Set the specimen on the stage with the cover glass facing up.
- Bring the specimen image into focus, using the 10X objective.
- Close the field of view diaphragm to its minimum setting by means of the field diaphragm ring.
- Turn the condenser focus knob to bring the field diaphragm image into focus on the specimen plane.
- Adjust the condenser centering screws so that the image of the field diaphragm appears at the center of the field of view. At this time, stopping the field diaphragm image just short of the maximum field of view may be convenient for centering.
- Adjust and center the field diaphragm so that it is just outside the field of view for each magnification change.

II. Condenser Swing–Out Top Lens

- The top lens can be removed from the optical path by using the swing-out lever. Swing the top lens into the optical path during normal orthoscopic observation and conscopic observation. Swing out for orhoscopic observation with 4X or lower magnification.
- When measuring the retardation or observing the inference colour, swing out the top lens to make the illuminating light path as parallel as possible to the optical axis.

III. Condenser Aperture Diaphragm

In orthoscopic microscopy:

- The condenser aperture diaphragm is provided for adjusting the numerical aperture (N.A.) of the illuminating system of the microscope. It decides the resolution of the image, contrast, depth of focus and brightness.
- Stopping down will lower the resolution and brightness, but increase the contrast and depth of focus.
- An image with appropriate contrast can be obtained with an aperture setting that is 2/3 of the objective N.A.

To adjust the aperture diaphragm:

- Adjust the condenser aperture diaphragm ring by referring to the condenser aperture scale, or by observing the diaphragm image visible on the exit pupil inside the eyepiece tube. Introduce the Bertrand lens into the optical path and focus on the aperture diaphragm at its minimum setting. Open aperture diaphragm to 2/3 fields of view.
- When swinging out the top lens of the condenser for low magnification objectives, completely open the condenser aperture diaphragm.

In conoscopic microscopy:

- In conoscopic microscopy, the condenser aperture diaphragm works as a field diaphragm on the conoscopic image surface. Stop down the aperture diaphragm so it limits the periphery of the field of view of the conoscopic image.

4.4 Field Diaphragm

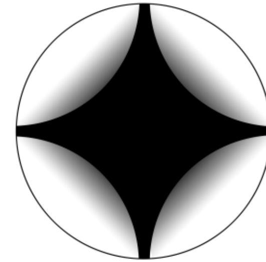
- The field diaphragm determines the illuminated area on the specimen. Rotating the field diaphragm ring changes the size of the field diaphragm. For normal observation, the diaphragm is set slightly larger than the field of view. If a larger than required area is illuminated, extraneous light will enter the field of view. This will create a flare in the image and lower the contrast.
- The thickness of the glass slide must be 1.7mm or less, otherwise the field diaphragm may not be focused on the specimen plane.
- The diaphragm does not have any effect when the condenser top lens is swung out of the optical path. Fully open the field diaphragm, as the numerical aperture of the illuminating system will be reduced if the diaphragm is excessively stopped down.

4.5 Orientation of Polarizer and Analyzer

- Slide in the analyzer slider to remove the analyzer from the optical path.
- Focus on the specimen.
- Take the specimen out of the optical path.
- Slide out the analyser slider to move the analyzer into the optical path.
- Set the analyser to the "0" position by loosening the analyzer clamp screw and rotating the analyser dial (the rotation angle of the analyser can be read in the range between 0º to 360º in increments of 0.1º by the Vernier scale).

Analyser rotating dial

Analyzer clamp screw

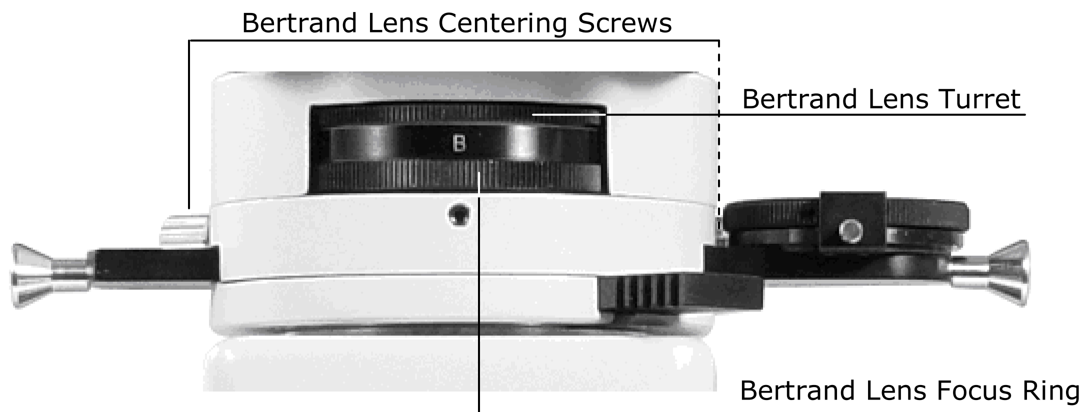


Dark cross image is formed on the exit pupil of the objective

- Rotate the Bertrand lens turret to “B” position and bring the Bertrand lens in the optical path to enable the exit pupil of the objective to be seen through the eyepiece. Rotate the polarizer so that a dark cross image is formed on the exit pupil as shown in the figure above.

4.6 Focusing and Centering the Bertrand Lens

- Rotate the Bertrand lens turret to “B” position and bring the Bertrand lens in the optical path.
- Bring 40x objective into optical path.
- Adjust the Bertrand lens focus ring under the Bertrand lens turret to focus on the image of the condenser aperture diaphragm that is stopped down to 70 – 80% of the numerical aperture of the objective.
- Adjust the Bertrand lens centering screws to bring the image of the condenser aperture to the center of the field of view.
- The centering procedure is the same as that for the condenser except that the condenser aperture diaphragm image is used instead of the field diaphragm image.



4.7 Compensators

- All polarizing microscopes are fitted with a slot in the intermediate tube above the nosepiece and between the polarizer and analyzer. This is intended for insertion into the optical path of a compensator.
- Compensators also referred to as retardation plates and are sections of optically anisotropic material with plane faces which, when inserted diagonally in the microscope between crossed polarizers, produce a specific optical path difference of mutually perpendicular plane-polarized light waves.

I. 1/4λ-plate - The 1/4λ-plate is called a mice plate because the compensator plate is mostly made of mica. It has an optical path difference in yellow light of around 140nm (yellow light has λ = 580nm, therefore 1/4λ = 580/4 = 145nm). It changes plane-polarized light into circularly polarized light.

II. 1λ-plate (sensitive tint or first-order red) - The 1λ-plate is called a gypsum plate of a thickness to give1λ optical path difference for green light of 550 nm. This wavelength is therefore extinguished with the resulting interference colour having the typical tint of the first-order red/violet. This magenta colour is sometimes termed 'sensitive tint'.

III. Quartz Wedge – This device has a range of 4 orders and is commonly employed for qualitative retardation measurements of petrographic specimens or other birefringent materials whose retardation value falls within the wedge limit. The quartz wedge is simplest form of compensator where the optical path-length difference is varied by the degree of insertion into the optical axis to match the optical path difference of the specimen.

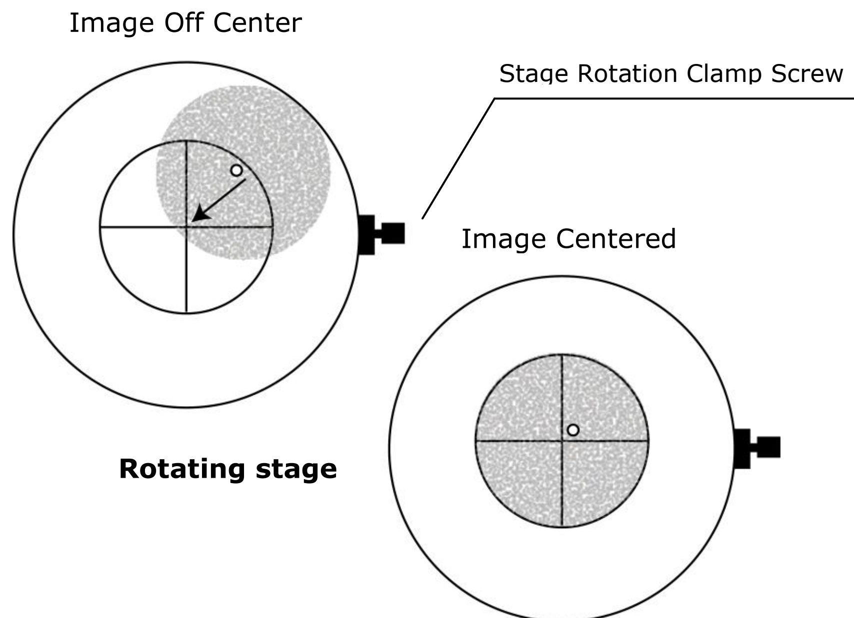
Measuring Retardation from 1λ to 4λ

- ***Observing Extinction Position***
  - Observe the position where the part of the specimen to be measured becomes darkest by rotating the stage under crossed polars.
- ***Observing Subtraction Position***
  - Rotate the stage 45° to the diagonal position where the specimen appears to be at it's brightest. Insert the quartz wedge into the slot and optical path; verify the interference colour of the part to be measured changes towards the lower order. If the colour changes towards the higher order, rotate the stage another 90º.
- ***Measuring Retardation***
  - Slide the quartz wedge along the length of the slot, and the interference colour will change.
  - Stop sliding the quartz wedge where the dark band covers the part of the specimen to be measured. Remove the specimen and compare the interference colour (at the same position without the specimen) with the Interference Colour Chart to ascertain the amount of retardation.
  - Measuring the retardation or ascertaining by interference colour should be done with field of view diaphragm stopped down to the part to be measured.

Note: With monochromatic light the coloured fringes are seen as alternating dark and bright bands.

4.8 Centering the Objective

- The BA310 Polarizing microscope allows for centering of three objectives with a reference objective.
- Objective centering screws on the centering nosepiece are used to align the optical axis and the stage.
- Before centering the objectives, look through the binocular tube at the field of view, pick out an easily recognizable target and then rotate the stage.
- The target should illustrate a concentric circle of rotation about the intersection of the cross lines. If it does not, rotate the stage until the target is farthest from the intersection of the closslines, bring it in halfway by means of the centering screws, and then bring it to the center of the stage by moving the slide itself. Rotate the stage and repeat the procedure if the centering has not been accomplished the first time.



5 Using an Oil Immersion Objective

- Oil immersion objectives are labelled with the additional engraving "Oil" and are immersed in oil between the specimen and the front of the objective.
- The immersion oil supplied by Motic is synthetic, non-fluorescing and non-resining oil, with a refractive index of 1.515
- Normally and a few exceptions, cover glass must be used with oil immersion objectives. Deviations from thickness are not important as a layer of immersion oil acts as compensation above the cover glass.
- The small bottle of oil supplied with every immersion objective facilitates application of the oil to the cover slip.
- Remove any air bubbles in the nozzle of the oil container before use.
- Immersion oil must be used sparingly. After the examination, the oil should be wiped off the objective with a lens cleaning tissue and the residual film removed with soft cloth moistened with petroleum benzine or absolute alcohol.
- Locate the field of interest, with a lower magnification objective, swing the objective out of the light path, and add one drop of immersion oil over the site of the specimen. Swing in the oil immersion objective. Use the fine focus to make the image sharp.
- Freedom from air bubbles must be ensured. To check for air bubbles, remove an eyepiece, fully open the field and aperture diaphragms, and look at the exit pupil of the objective within the eyepiece tube. Air bubbles are recognized by a surrounding black ring. Bubbles may often be dislodged by moving the slide to and fro or by slightly rocking the revolving nosepiece back and forth. If the bubbles cannot be successfully cleared, the oil must be wiped off and replaced with a fresh drop.

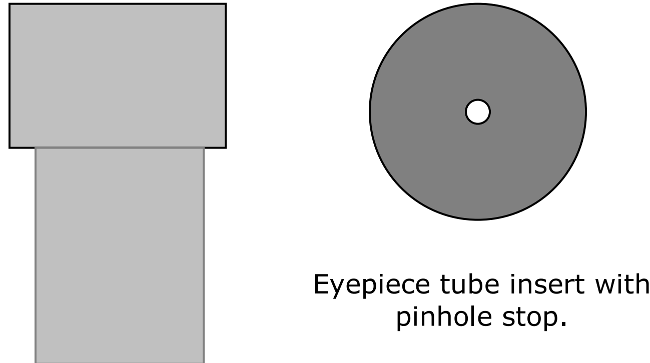
6 Photomicrographic Procedure

- To ensure vibration free operation, set the microscope on a sturdy vibration free table or a bench with a vibration proof device.
- Pull the optical path selection lever of the trinocular eyepiece tube all the way out to the limit, the ratio of light entering the observation tube and phototube will be 20:80.
- For the same total magnification, select a combination of the highest possible objective magnification and lowest possible projection lens magnification to achieve the utmost image definition and contrast.
- To ensure optimal illumination, check the position and centering of the lamp and position of the condenser.
- Select a blue filter for routine application. An additional colour-compensating filter can be used depending on the colour rendition.
- Adjustment of the field diaphragm is important for the purpose of limiting extraneous light that may cause flare and lower the contrast. Stop down the diaphragm to achieve an illuminated area slightly larger than that of the field of view.
- A change to depth of focus, contrast and resolution of the image is attainable with an aperture setting that is 2/3 of the objective N.A.
- For photomicrographic procedures, refer to the manual of the specific camera being used.

  Note: The correlation between the position of the polarizing plate and photomicrographic devices should not be of any concern to the user, given that the intermediate tube contains a built-in depolarizer.

7 Accessories

7.1 Pinhole Stop



Eyepiece tube insert with pinhole stop.

- Replace one of the eyepieces with an eyepiece tube insert with a pinhole stop.
- Remove the Bertrand lens out of the optical path and the conoscopic image can observed overlapping the orthoscopic image through the binocular observation.

7.2 Interference Colour Chart

- Examine the quartz wedge between crossed polarizers under white light. It produces a range of coloured bands that form **Newton's colour scale,** which is reproduced commercially as the Michel Levy Chart.
- At the thin edge of the wedge the thickness and retardation are 0, all of the wavelengths of light are cancelled at the analyzer resulting in a black colour.
- With increasing thickness, corresponding to increasing retardation, the interference colour changes from black to gray to white to yellow to red and then a repeating sequence of colours from blue to green to yellow to red. The colours get paler, or more washed out with each recurrence.
- In the above image, the repeating sequence of colours changes from red to blue at retardations of 550, 1100, and 1650 nm. These boundaries separate the colour sequence into first, second and third order colours.
- Above fourth order, retardation > 2200 nm, the colours are washed out and become white.
- The interference colour produced is dependent on the wavelengths of light, which pass through the analyzer, and the wavelengths that are cancelled.

8 Terminology

Aperture, Numerical (N.A.)
The numerical aperture is an important factor determining the efficiency of the condenser and objective. It is represented by the formula:
(N.A. = $\eta \sin\alpha$), where η is the refractive index of a medium (air, water, immersion oil etc.) between the objective and the specimen or condenser, and α is half of the maximum angle at which light enters or leaves the lens from or to a focused object point on the optical axis.

Anisotropic
Quality of a transparent material having different refractive indices depending on the vibration direction of the transmitted light, hence any material that affects polarized light differently according to its direction through the material.

Axis - Optical
A straight line joining the centers of curvature of lens surfaces.

Bertrand Lens
An intermediate lens, which transfers an image of the back focal plane of the objective into the primary image plane. Mostly used for conscopic observation in polarized light microscopy.

Calcite
A doubly refracting mineral used in the manufacture of polarizing prisms.

Cover Glass Thickness
Transmitted light objectives are designed to image specimens that are covered by a thin cover glass (cover slip). The thickness of these small glass pieces is now standardized at 0.17 mm for most applications.

Conoscopic Observation
The study of the back focal plane of the objective is called conoscopic as the observations are associated with the cone of light furnished by the condenser and viewed by the objective. This study is accomplished by inserting a Bertrand lens, by examining the image with a Pinhole stop or by using a phase telescope.

Diaphragm, Condenser
A diaphragm, which controls the effective size of the condenser aperture. A synonym for the condenser illuminating aperture diaphragm.

Diopter Adjustment
The adjustment of the eyepiece of an instrument to provide accommodation for the eyesight differences of individual observers.

Epi-Illumination
Illumination is accomplished by means of a vertical illuminator placed above the objective. The axis of illuminating ray bundle falling on the object may or may not coincide with the microscope objective.

Focusing Eyepiece
An eyepiece with a device for focusing a graticule mounted within it and coinciding with the primary image plane.

Michel Levy Scale Of Retardation Colours
Colour chart-plotting thickness of the anisotropic specimen, its birefringence (n1-n2) and its retardation in nanometers. Any one of the three variables can be determined if the other two are known.

Micrometer: *um*
A metric unit of length measurement= 1×10^{-6} meters or 0.000001 meters

Nanometer: *nm*
A metric unit of length measurement= 1×10^{-9} meters or 0.000000001 meter.

Orthoscopic Observation
This is the normal way of viewing an object through a microscope. With Kohler illumination, the field diaphragm and the ocular front focal plane as well as the specimen will be in simultaneous focus.

Stage Micrometer
The graduated scale used as a standard on the stage of a light microscope for calibrating an eyepiece micrometer.

Crossed Polars The condition in which the vibration directions of polarizers and analysers are mutually perpendicular. **Depolarizer** Depolarizers change plane polarization into a mix of polarization states, which resemble un-polarized light.	**x-axis** In a plane Cartesian coordinate system, the horizontal axis, or axis in the left to right direction. **y-axis** In a plane Cartesian coordinate system, the vertical axis orthogonal to the x-axis.

9 Troubleshooting Table

As you use your microscope, you may occasionally experience a problem.

The troubleshooting table below contains the majority of frequently encountered problems and the possible causes.

Problem	Possible Cause
Vignetting or uneven brightness in the field of view or field of view only partially visible	Analyser slider in intermediate position
	Compensator slider in midway position
	Bertrand lens in optical path
	Condenser not mounted correctly
	Condenser is not centred
	Condenser is set too low
	Condenser top lens not fully swung in or out
	Field diaphragm closed too far
	Aperture diaphragm closed too far
	Improper condenser objective combination
	Revolving nosepiece not clicked into position
	Trinocular eyepiece tube optical path selector lever in intermediate position
Dust or dirt in the field of view	Aperture diaphragm closed too far
	Condenser is set too low
	Dust or dirt on specimen surface
	Dust or dirt on field lens, filter, condenser or eyepiece
Poor image (low contrast or resolution) Uneven focus	Condenser is set too low
	Aperture diaphragm closed too far
	No cover glass
	Too thick or thin cover glass
	Immersion oil not used on immersion procedure
	Air bubbles in immersion oil
	Specified immersion oil used not used
	Immersion oil on dry objective
	Greasy residue on eye lens
	Incorrect illumination
	Specimen holder not fixed securely on stage
	Specimen not secured in position
Image tinged yellow	Lamp voltage is set too low
	Blue filter is not being us
Focusing is not possible with high magnification objectives	Slide is upside down
	Cover glass is too thick
High magnification objectives strike the specimen when changing over from low to high magnification	Slide is upside down
	Cover glass is too thick
	Eyepiece diopter not adjusted
Insufficient parfocality of objectives	Eyepiece diopter not adjusted
No cohesion of binocular image	Magnification or field of view of left and right eyepieces differ
	Interpupillary distance not adjusted
	Eyepiece diopter not adjusted
Eye strain or fatigue	Interpupillary distance not adjusted
	Diopter adjustment not made
	Field of view of left and right eyepiece differ
	Inadequate illumination

Electrical

Problem	Possible Cause
Lamp does not light	Power supply not plugged in
	Lamp not installed
	Lamp burnt out
Inadequate brightness	Specified lamp not being used
Lamp blows out immediately	Specified lamp not being used
Lamp flickers	Connectors are not securely connected
	Lamp near end of service life
	Lamp not securely plugged into socket

10 Care and Maintenance

Lenses and filters

- To clean the lens surfaces or filters, first remove any dust using an air blower. If dust still persists, use a soft/clean brush or gauze.
- A soft gauze or lens tissue lightly moistened with pure alcohol should only be used to remove grease or fingerprints.
- Use petroleum benzine to clean immersion oil.
- Use petroleum benzine only to remove immersion oil from objective lenses.
- Because petroleum benzine and absolute alcohol are both highly flammable, handle carefully around an open flame.
- Do not use the same area of the gauze or tissue, more than once.

Cleaning of Painted or Plastic Components

- Do not use organic solvents (thinners, alcohol, ether, etc.), doing so could result in discolouration or in the peeling of paint.
- For stubborn dirt, moisten a piece of gauze with diluted detergent and wipe clean.

When Not In Use

- When not in use, cover the instrument with a vinyl dust cover, store in a location low in humidity and where mould is not likely to form.
- Store the objectives, eyepieces and filters in a container or desiccator with a drying agent.
- Proper handling of the microscope will ensure years of trouble free service.

If repair become necessary, please contact your Motic agency or our Technical Service directly.