IM-3000B Metallurgical Microscope

INSTRUCTION MANUAL

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Equipment Type:	Metallurgical Microscope
Model:	***IM-3000B***
Electrical Requirements:	110 / 220 Volts (single-phase)
Frequency:	50/60 Hz
Manual Revision Date:	December 12, 2022

Please read this instruction manual carefully and follow all installation, operating and safety guidelines.

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WARRANTY

Terms and Conditions applying to all PACE Technologies Products

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3. DELIVERY:
Customer assumes and shall bear the risk of all loss or damage to the Products from every cause whatsoever, whether or not insured, and title to such Products shall pass to Customer upon PACE Technologies delivery of the Products to the common carrier of Pace Technologies choice, or the carrier specified in writing by Customer, for shipment to Customer. Any claims for breakage, loss, delay, or damage shall be made to the carrier by the Customer and Pace Technologies will render customer reasonable assistance in prosecuting such claims.

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4. ACCEPTANCE:
Customer shall inspect the Products promptly upon receipt of delivery. Unless customer objects in writing within thirty (30) business days thereafter, customer shall be deemed to have accepted the Products. All claims for damages, errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

5. PAYMENT:
Customer agrees to provide timely payment for the Products in accordance with the terms of payment set forth on the reverse side hereof or in any proposal submitted herewith. If any payment is not paid on or before its due date, Customer shall pay interest on such late payment from the due date until paid at the lesser of 12% per annum or the maximum rate allowed by law.

6. DEFAULT:
If Buyer is in default (including, but not limited to, the failure by Buyer to pay all amounts due and payable to Seller) under the work or purchase order or any other agreement between Buyer and Seller, Buyer 's rights under the warranty shall be suspended during any period of such default and the original warranty period will not be extended beyond its original expiration date despite such suspension of warranty rights.

7. MISCELLANEOUS PROVISIONS:
This agreement has been made in and shall be governed by the laws of the State of Arizona. All disputes arising under or relating to the purchase of the equipment shall be brought and resolved solely and exclusively in the State of Arizona, Pima County . These terms and conditions and the description of the Products on the reverse side hereof or in any proposal submitted herewith constitute the entire agreement and understanding of the parties with respect to this sale and supersede all prior and contemporaneous agreements or understandings, inducements or representations, expressed or implied, written or oral, between the parties with respect hereto. Any term or provision of this Agreement may be amended, and any observance of any term of this Agreement may be waived, only by a writing signed by the party to be bounds. The waiver by a party of any breach shall not be deemed to constitute a waiver of any other breach. Should suit be brought on this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs of suit including costs and attorneys' fees incurred on appeal or in collection of any judgment., errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

8. RESTOCKING FEE:
All Returns are subject to a restocking charge equal to 15% (fifteen percent) of the Invoice, unless the Goods are proved to be non-conformed by PACE Technologies.

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1.0 Product Description

IM-3000B Inverted Metallurgical Microscope
Bright-field illumination

The IM-3000B is a basic inverted metallurgical microscope featuring bright-field illumination, binocular eyepiece tubes and a digital camera port. The IM-3000B inverted microscope is an excellent choice for a multipurpose economical metallurgical microscope. Objectives range from 5X, 10X, 20X, 50X and 100X with wide field 10X eyepieces.

Figure 1. IM-3000B metallurgical microscope

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1.1 Technical Specifications

Electrical specifications:	110 / 220V single-phase (50/60 Hz)
Optical system:	Infinity optical system
Viewing head:	Binocular head inclined 45 degrees
Light intensity ratio:	Observing 80%, camera 20% Observing 100%, or camera 100%
Eyepieces:	Wide field eyepiece WF10X/22mm Wide field eyepiece WF15X/16mm Wide field eyepiece WF20X/12mm
Nosepiece:	Quintuple nosepiece
Objective:	Plan achromatic objective: 5X, 10X, 20X, 50X, 100X
Focus:	Coaxial coarse and fine focus adjustment, division of fine focus adjustment; 0.002mm Moving range: upward 1 mm, downward 7 mm
Stage (movement):	226 x 178 mm (40 x 40 mm)
Illumination:	12V/50W halogen lamp with brightness and centering adjustment.
Dimensions (WxHxD):	Approx. 13 x 18 x 18 inches (330 x 450 x 450)
Dimensions (WxHxD):	9 x 22 x 25-inch (229 x 560 x 635 mm)

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1.2 Features and Benefits

The ***IM-3000B*** metallurgical microscope provides brightfield (BF) illumination. The **IM-3000B** metallographic microscope is a powerful optical tool for the metallographer and metallurgist.

2.0 Unpacking, Shipping and Installation

2.1 Unpacking

Unit is delivered in a box. Unpack and check for completeness of parts.

Measures WxHxD: (box). 18x18x27-inches

Weight: Varies, depending upon model (approximately 35 lbs).

2.2 Shipping

When moving box, lift from bottom.

! **Caution: Very** sensitive optical instrumentation. Take care to avoid bodily injury and damage to the unit.

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2.3 Installation

! Install unit carefully! Improper installation voids warranty.

The ***IM-3000B metallographic microscope*** should be placed on a flat stable surface. Requires electrical connection.

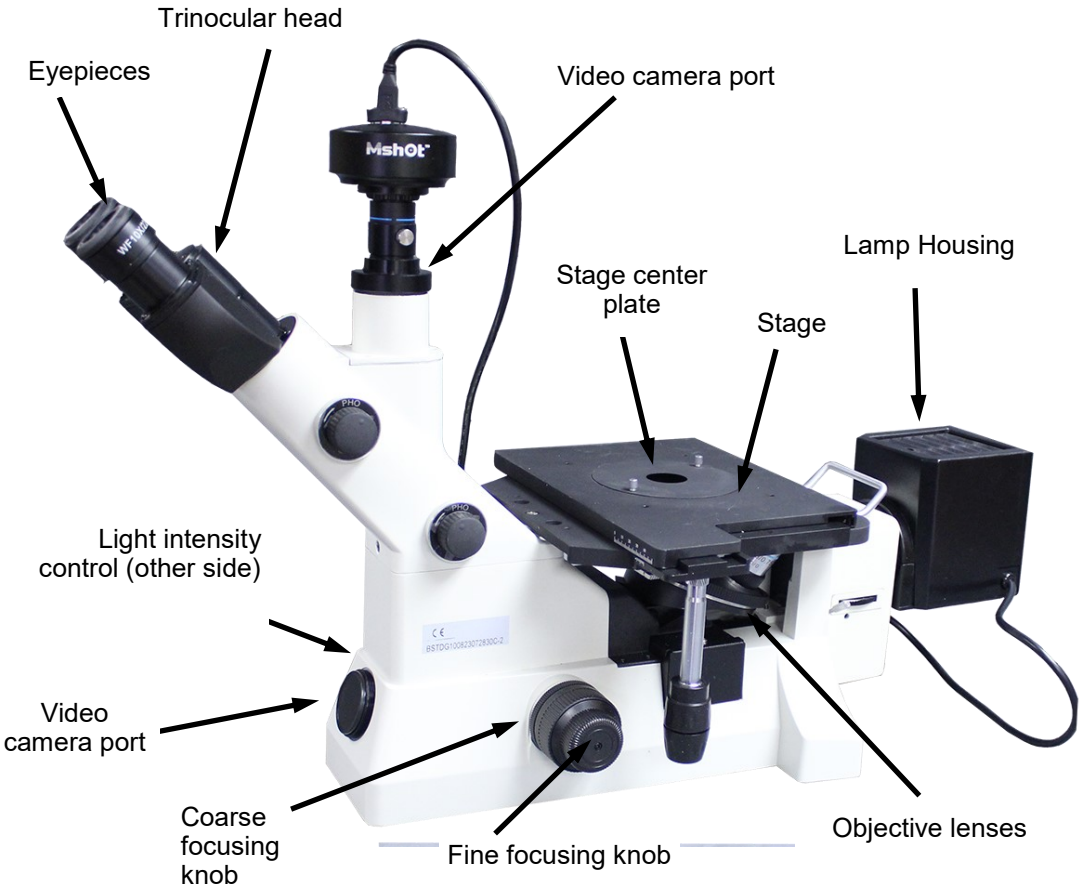

Figure 2. Overview of IM-3000B metallurgical microscope

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2.3.1 Sequence for Assembly

2.3.1.1 Installing Objectives

-Before assembling objectives into turret, spray with clean dry air to remove dust. If necessary use IPA to clean any heavier debris.

-Screw in lowest magnification objective and then rotate turret clockwise and insert next higher magnification objective.

-Add remaining objectives.

-If there are any remaining holes in turret cover with dust cap.

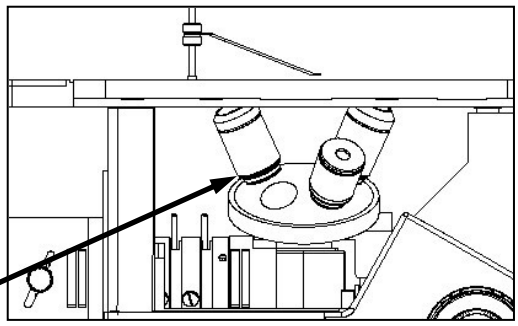
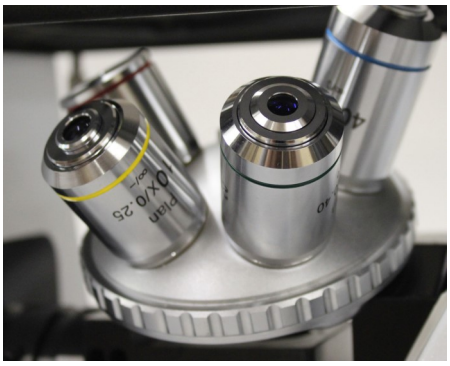


Figure 3. Objective turret



2.3.1.2 Adjust focusing knob tension (if necessary)

Focusing knob tension is pre-set at the factory, however, it can be adjusting by turning the focusing adjustment collar.

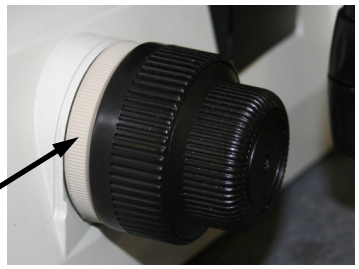


Figure 4. Focus tension collar

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2.3 Installation (continued)

2.3.1.3 Installing and Replacing Bulb

 Requires Halogen Lamp (12V/50W)

! Caution: Bulb and lamp housing can get very hot. Turn off power and let cool before removing or replacing.

1. Let bulb and housing cool before removing

2. Remove hex bolt on the light cover (Figure 5).

3. Push clip to remove old bulb and replace with new blub (Figure 6)

Figure 5. Housing Assembly

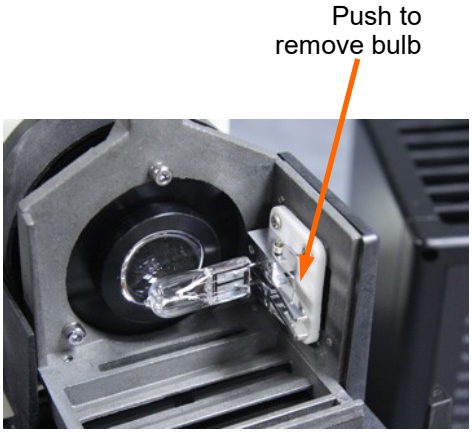

Figure 6. Bulb replacement

! Caution: Use cotton gloves when handling light bulb. Do not touch with fingers as oil from fingers can significantly reduce the life of the bulb.

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2.3 Installation (continued)

2.3.1.4 Installing Objective Lenses

Unlock turret: For shipping the turret is locked to prevent it from moving up and down during transport. To unlock turret loosen the collar (2) on the right side of the microscope located in front of the focusing knobs next to the microscope base.

Adjust tension so that the turret can move up and down freely but is not too loose so that it moves under its own weight.

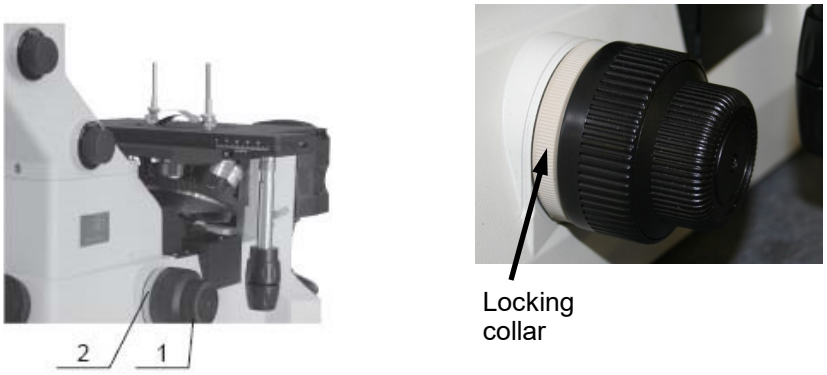

Figure 7. Tension adjustment for turret nose-piece

Install Objectives: Be sure to clean any dust and debris off the objective lenses and the turret nosepiece before installing objectives.

Install 5X objective and then rotate counter-clockwise sequentially adding higher magnification lenses.

Figure 8 Installing Objective Lenses

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2.3 Installation (continued)

2.3.1.5 Installing Polarizer

Polarizer installation

Figure 9. Installing Polarizer

Install polarizer: Slide polarizer into slot as shown (Figure 9).

2.3.1.6 Eyepiece assembly

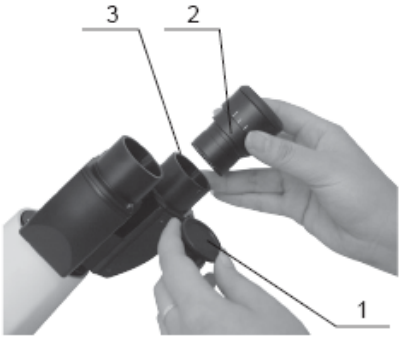

Figure 10. Installing Eyepiece

1. Remove protective cap
2. Insert eyepiece into tube
3. Adjust eyepiece to set focus on eyepiece scale, focus on sample and adjust other eyepiece so both eyepieces are in the same focus.

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2.3 Installation (continued)

2.3.1.7 Auxiliary stage assembly

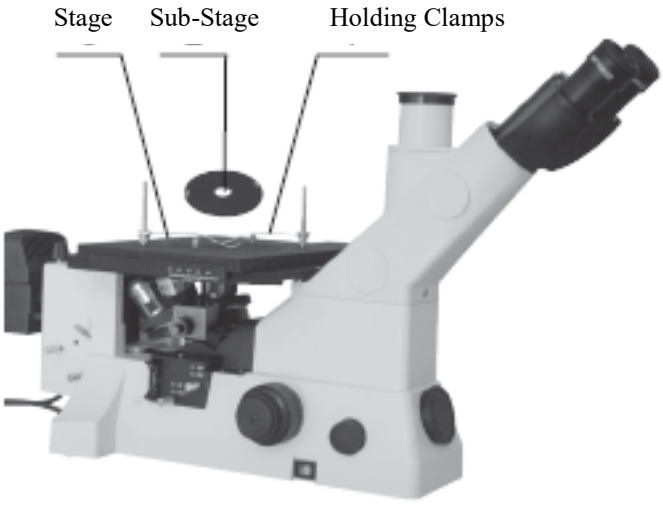

Figure 11. Stage plate assembly

Three different stage plates are supplied with the IM-3000B metallographic microscope. Insert into ring on top of primary stage.

The auxiliary stages can be rotated to square up the specimen.

2.3.1.8 Power connections

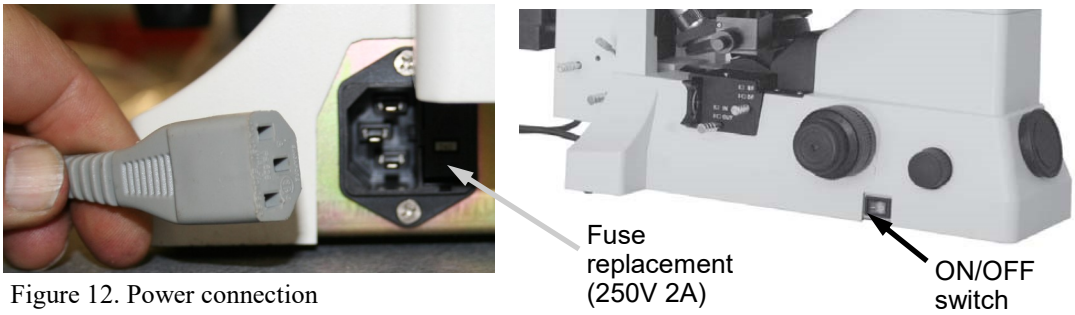

Figure 12. Power connection

Use a three prong grounded plug. Input power can range from 110V to 220V.

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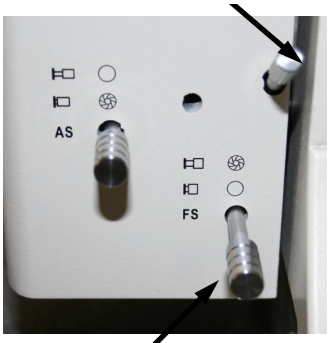
3.0 Adjustments

3.0.1 Field diaphragm alignment

Field diaphragm alignment



Field diaphragm adjustment

1. The field diaphragm allows the amount of light entering the sample to be controlled. This allows for the wavelength of light to be constant.

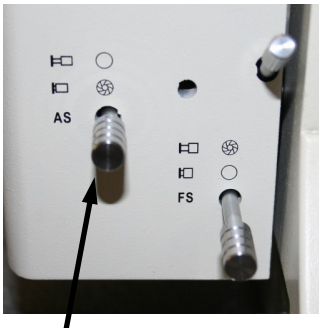
   In comparison, adjusting the intensity of the light source alters the wavelength of the light and can degrade the image quality.

2. Reduce the field diaphragm by pulling out field diaphragm knob.

3. Center field diaphragm by rotating alignment knob.

4. Open field diaphragm (pushing in knob) so that it is just outside the field of view.

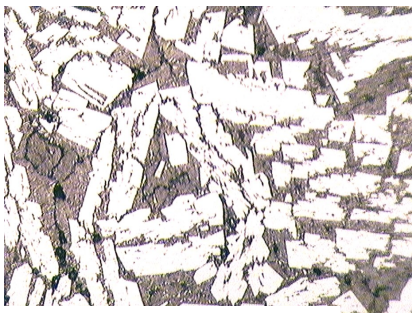
3.0.2 Aperture or Condenser diaphragm adjustment



Aperture diaphragm adjustment

1. The aperture or condenser diaphragm alters the sample contrast, which in turn changes the microscopes numerical aperture. The result is an effective change in the depth of field of the image (may be very considerable at higher magnifications).

2. Push or pull to adjust aperture diaphragm.



Aperture diaphragm OUT

Aperture diaphragm IN

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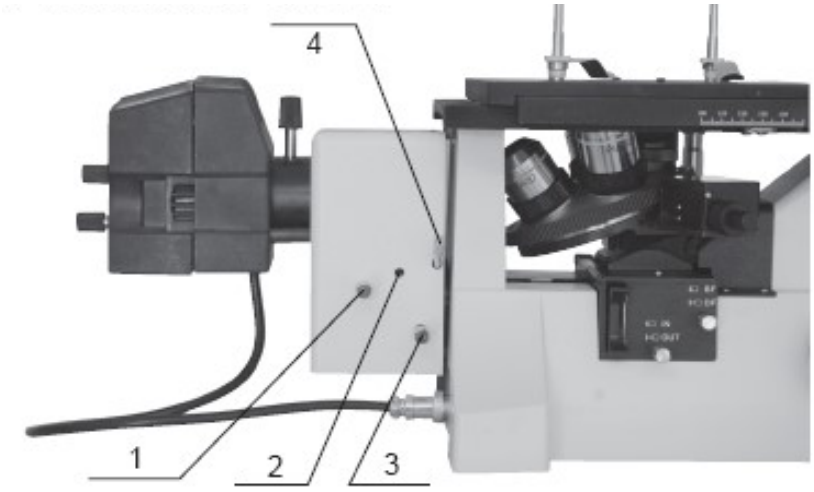
3.0.3 Aperture or Condenser diaphragm alignment

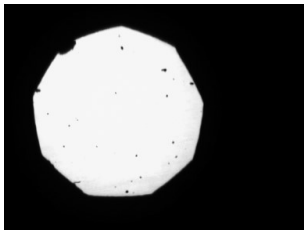
The aperture or condenser diaphragm has been aligned at the factory, however, it may shift during transportation.



1. Remove eyepiece and set objective lens to 50X
2. Push or pull to adjust aperture diaphragm (no.1) (observe the aperture movement, the light should remain in the center)
3. If the light is not in the center, adjust the set screw (no. 2) with the allen hex wrench (note there is a second set screw on the other side of the microscope). Adjust so that the light is in the center.

3.0.4 Field Stop diaphragm alignment

1. Close down the field diaphragm (no. 3) as shown.
2. Center with adjusting knobs (no. 4) (note there is a second knob on the other side of the microscope). Adjust so that the diaphragm is in the center.



Field diaphragm should be centered in the field of view

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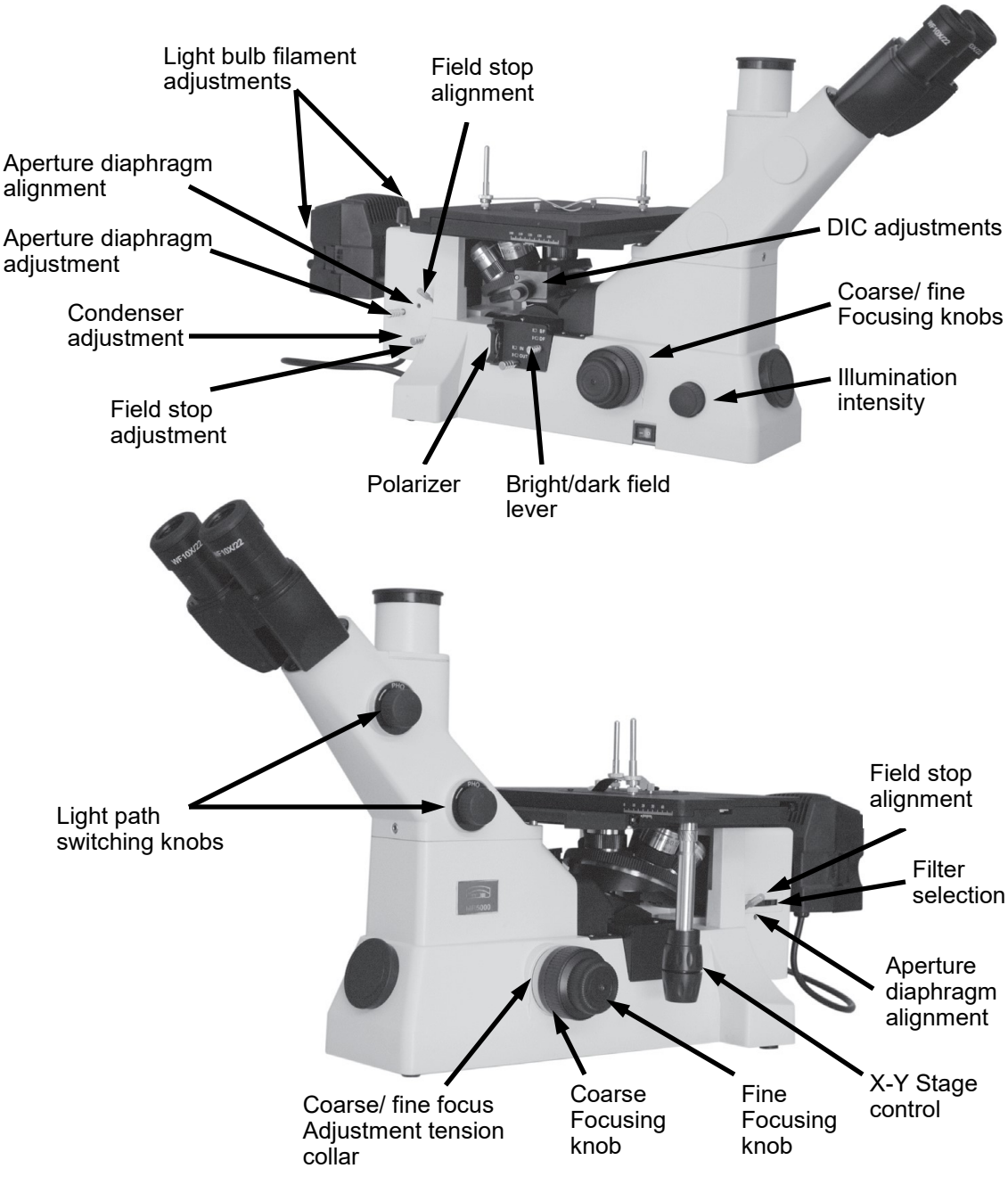
4.0 Operating Parts



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5.0 Operation

5.1 Lamp operation

1. Turn on main switch.
2. Rotate knob to adjust intensity of light

NOTE: Reducing the intensity of the bulb will prolong the life of the bulb. Also when using the microscope turn down the intensity but do not turn off when on stand-by (this keeps the bulb warm and does not shock it by constantly turning it on and off)

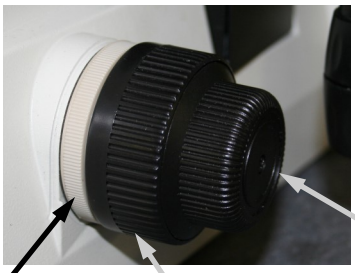
5.2 Focusing

1. Adjust the tension for the focusing knob with the collar next to the microscope base

   Turn counter clockwise (CCW) to increase tension

   Turn clockwise (CW) to decrease tension

2. Adjust coarse focus with larger knob
3. Adjust fine focus with outside knob



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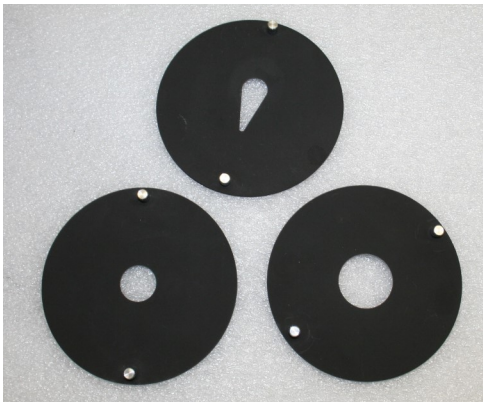
5.3 Mechanical Stage

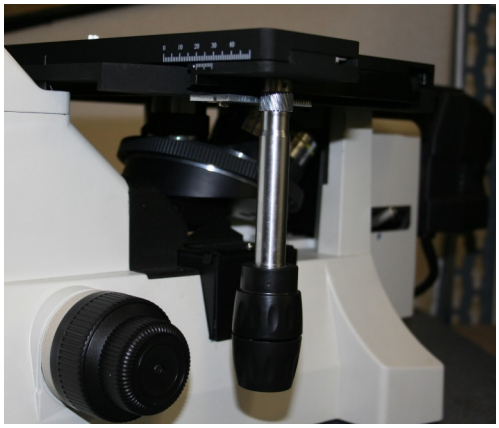
1. Place sample on sub-stage (interchangeable)

2. Using the dual stage control knobs the stage can be moved in either the X-axis or Y-axis direction (40 mm x 40 mm) (1.5 x 1.5-inch)

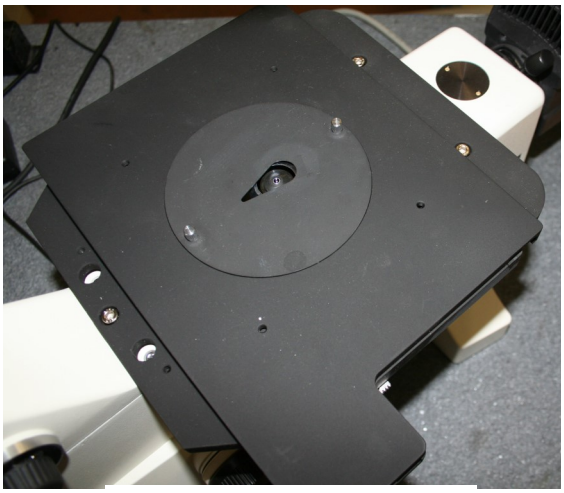
   Note stage has a scale to monitor movement (0.1 mm accuracy)



Microscope sub-stages



X-Y stage controls



Microscope X-Y stage

Calibrated stage movement

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5.4 Binocular viewing head

5.4.1 Eyepiece focus adjustment

1. The eyepieces can be focused independently of each other by adjusting the focus for each eyepiece.

2. Place a sample on the stage and focus by viewing with only one eyepiece.

3. Adjust the second eyepiece to match the focus of the first by rotating the top of the eyepiece while holding the base.

Eyepiece adjustment

5.4.2 Adjusting Interpupillary Distance

1. The interpupillary vision or distance between the center of the pupils of the two eyes is different for each persons. By adjusting the interpupillary distance of the eyepieces the eyes will only see one image when viewed through the microscope.

2. To adjust hold one side of the eyepiece prism and rotate with the other side to change the viewing width.

   Range of interpupillary distance 55-75 mm

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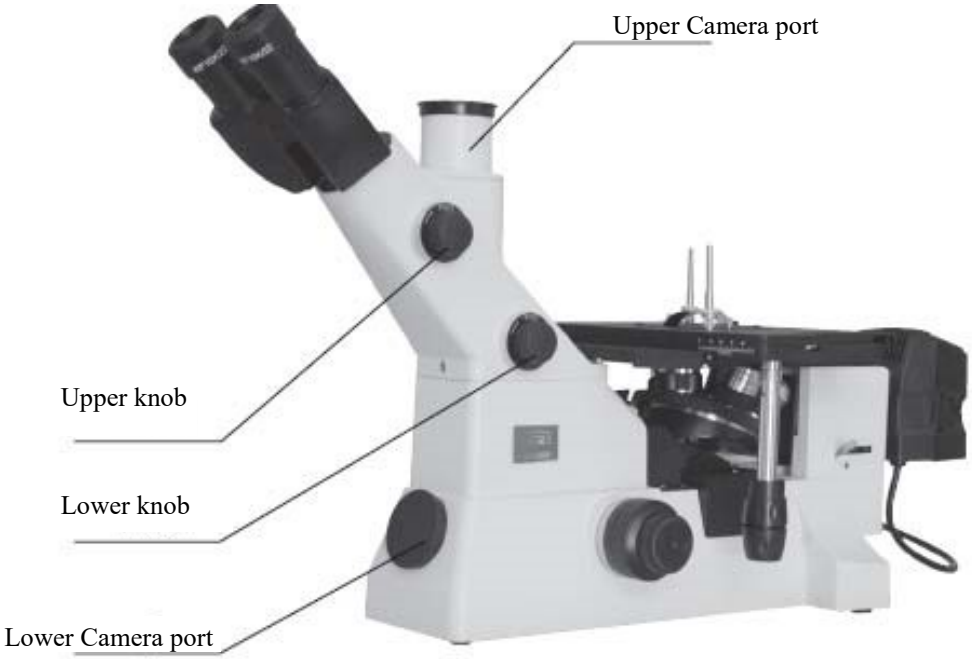
5.5 Light path control knobs



1. Lower knob controls the light path to the camera ports or to the eyepieces. In the PHO position, the light is directed to the lower camera port. In the neutral position the light path is to the eyepieces/upper camera port.

2. Upper knob controls the light path between the eyepieces and the upper camera port. In the PHO position, 20% of the light goes to the camera port and 80% for binocular viewing

   In the neutral position, 100% of the light is directed to the eyepieces.

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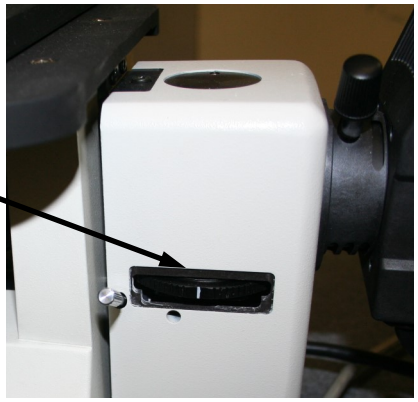
5.6 Filters

Green filter	Monochrome contrast filter.
Ground glass:	Diffuses filament image to produce more uniform lighting.
Blue:	Used for lower light setting to compensate for the lower temperature of the light (reduces the yellow-orange color for daylight photographic film).
Yellow:	Monochrome contrast filter.
Gray:	Monochrome contrast filter.

Rotate filter on back right side of microscope.



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5.7 Camera set-up

- Attach camera to adapter
- Attach C-mount camera adapter to microscope port on microscope
- Set light path to PHO to direct light rays to camera

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5.8 Focusing eyepieces to camera

- Insure that the light bulb is centered and the illumination is correctly set
- Adjust the focus so that the image on the computer screen is in focus
- Adjust the focus on the eyepieces so that the image is in focus.

Rotate this part of the eyepiece to focus the eyepiece

Hold this section of the eyepiece in place

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6.0 Safety Guidelines

6.1 Warning Sign

! This sign points to special safety features on the instrument.

6.2 Safety Precautions

! Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the **IM-3000B *metallographic microscope***.

! Proper operator training is required for operation of the **IM-3000B *metallographic microscope***. Any unauthorized mechanical and electrical change, as well as improper operation, voids all warranty claims. All service issues need to be reported to the manufacturer / supplier.

! Operate unit as specified in this manual.

! Disconnect power before opening unit.

! Let lamp and lamp house cool before changing bulb.

! When unit is not in use turn light bulb power down slowly to cool before turning off power.

6.3 Emergency Statement

The **IM-3000B *metallographic microscope*** has been designed for analyzing metallographic specimens. Always follow proper operational guidelines and avoid contact with moving lubricants and abrasives. .

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7.0 Maintenance

7.1 Introduction

The **IM-3000B *metallographic microscope*** requires very minimal maintenance. To keep the unit clean cover with microscope cover after use.

7.2 Cleaning lenses

Use only an alcohol such as IPA for cleaning the objectives and eyepieces.

7.3 Replacing light bulb

Do not touch the light bulb with fingers directly, the oil on the skin will significantly reduce the life of the light bulb. Use cotton gloves.

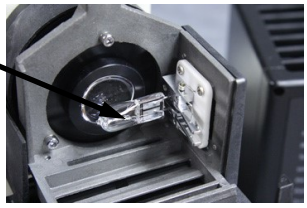
-Remove light bulb casing

-Remove old light bulb. Be careful if the bulb recently burned out as it may still be hot.

- Install new bulb, make sure it is pushed all the way down, otherwise it may not be possible to focus the light.

Remove housing cover by pulling off the top part

Insert new bulb and make sure it is completely pushed all the way in



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8.0 Trouble Shooting (Optical Path)

Problem	Cause	Solution
Bulb lights but the field is dark	a. The aperture or field diaphragm is closed. b. Analyzer and polarizer are engaged in light path. c. Light path selector knob for trinocular tube is not positioned properly d. Mirror selector lever is in an intermediate position	a. Open the aperture and field iris diaphragms. b. Disengage them from light path. c. Fully pull out the light path selector knob. d. Set the knob correctly
Field of view is obscured or not evenly illuminated	a. Light is not centered or condenser lens is not positioned correctly. b. Mirror selector lever is in an intermediate position. c. Revolving nosepiece is not in clicked position. d. Field iris diaphragm is not centered. e. ND filter is not in position. f. Lamp bulb is not installed properly. g. Analyzer and/or polarizer are not installed correctly	a. Center light and even out illumination with condenser lens. b. Set the knob correctly. c. Lock in the position. d. Center the field iris diaphragm correctly and open fully. e. Set into correct position. f. Push halogen bulb terminals all the way into the holder g. Engage analyzer and polarizer into light path.
Dirt or dust in field of view	A. Dirt / dust on eyepiece B. Dirt/ dust on specimen	Clean thoroughly.
Image defocused / low resolution	A. Revolving nosepiece is not in correct position B. The surface of the objective is contaminated. C. Dirt / dust on specimen	A. Position nosepiece turret into the correct position B. Clean thoroughly.
One side of image is blurred.	A. Objective is not engaged properly.	Turn revolving nosepiece so that it engages properly

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8.1 Trouble Shooting (Mechanical)

Problem	Cause	Solution
Coarse focus knob is hard to turn	Tension adjustment collar is too tight.	Loosen to proper tension.
Stage drifts down by itself or focus is lost during observation.	Tension adjustment collar is too loose.	Tighten collar to proper tension.
Cannot focus on specimen.	Stage height adjustment is to low.	Raise stage holder height.
Image shifts when stage is moved or touched.	Stage not properly mounted.	Clamp stage.
Field of view of one eye does not match that of the other eye.	Interpupillary distance is incorrect.	Adjust interpupillary distance.
Eye fatigue.	A. Incorrect eyepiece focus. B. Brightness too high.	A. Adjust eyepiece focus. B. Adjust bulb voltage.

8.2 Trouble Shooting (Electrical)

Problem	Cause	Solution
Lamp does not turn on	A. No power supply. B. Bulb installed incorrectly C. Bulb burned out. D. Connection of lamp housing power plug is incorrect. E. Power not turned on.	A. Check power cord B. Install bulb correctly C. Change the bulb D. Disconnect and reconnect E. Turn on power
Bulb burns out easily	A. Incorrect lamp. B. Oil from touching bulb.	A. Use recommended light and use lower voltage illumination. B. Use cotton gloves when installing new bulbs.